Algebra II
Lesson #3 Unit 7
Class Worksheet #3
For Worksheet #4

Given any two points in a plane,

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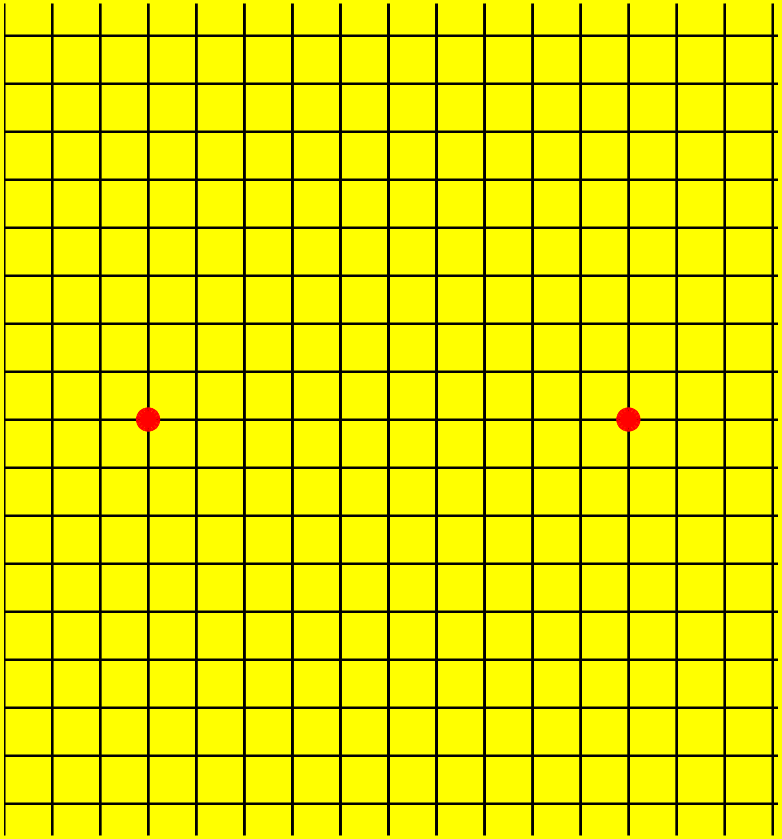
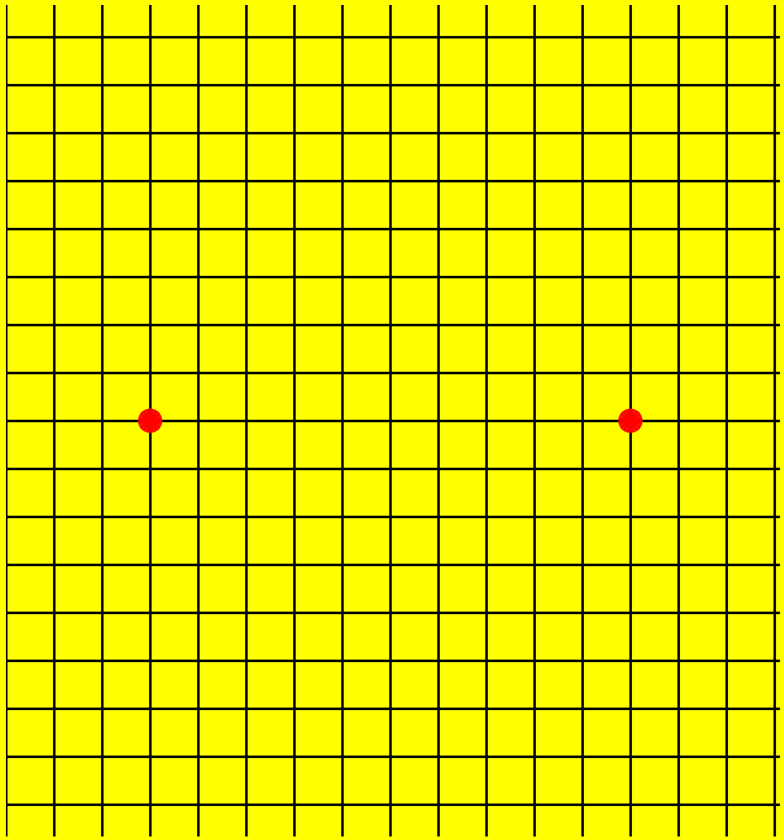


Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is a constant.



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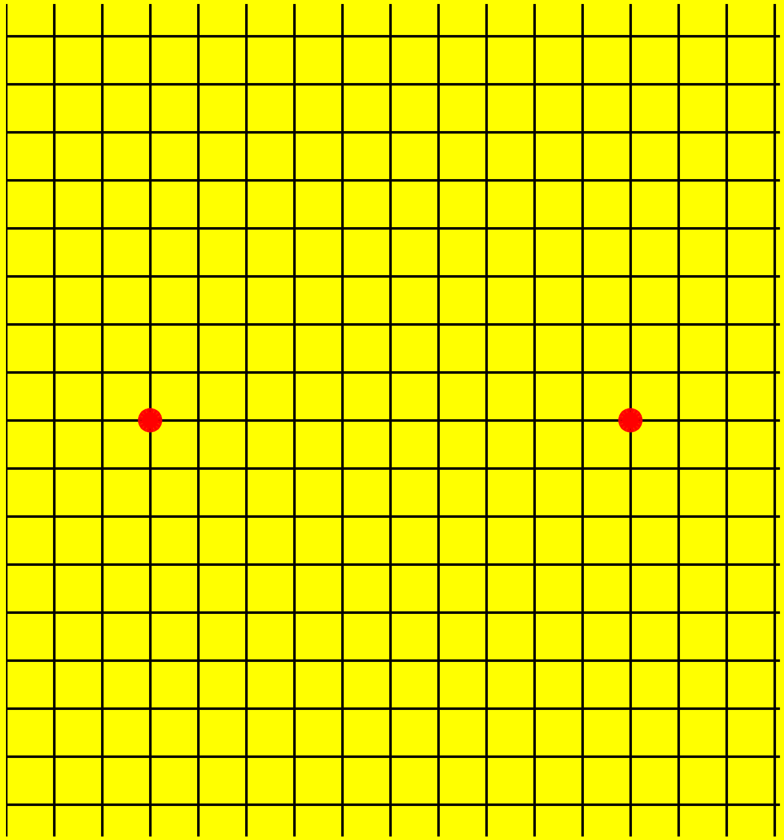
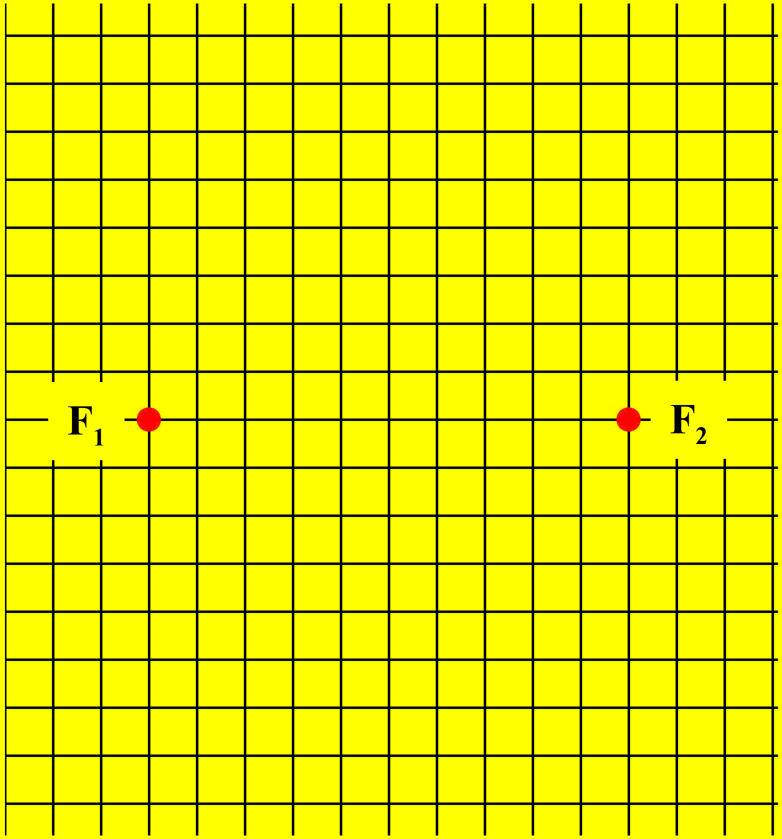


Once again, the two given points will be labeled F_1 and F_2.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is a constant.



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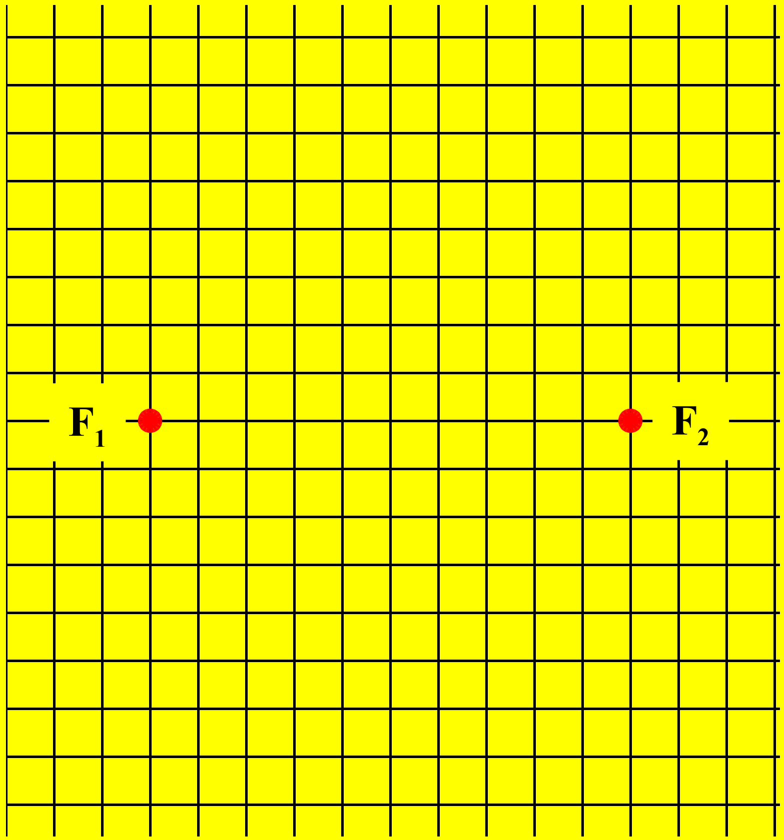
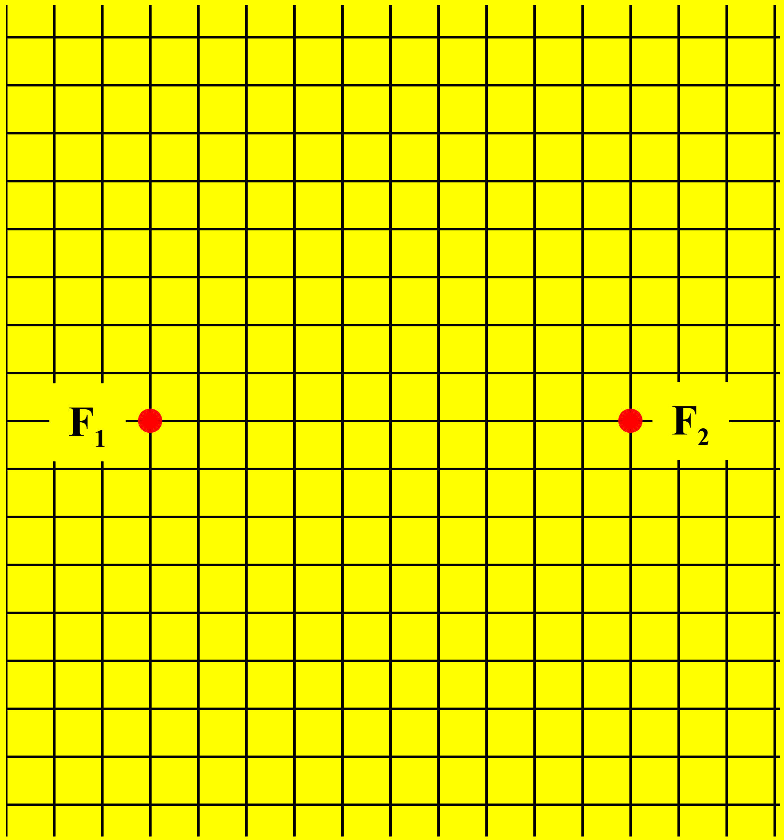
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is a constant.



Once again, the two given points will be labeled F_1 and F_2. We will find points such that the difference of their distances from F_1 and F_2 is 6 units.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.



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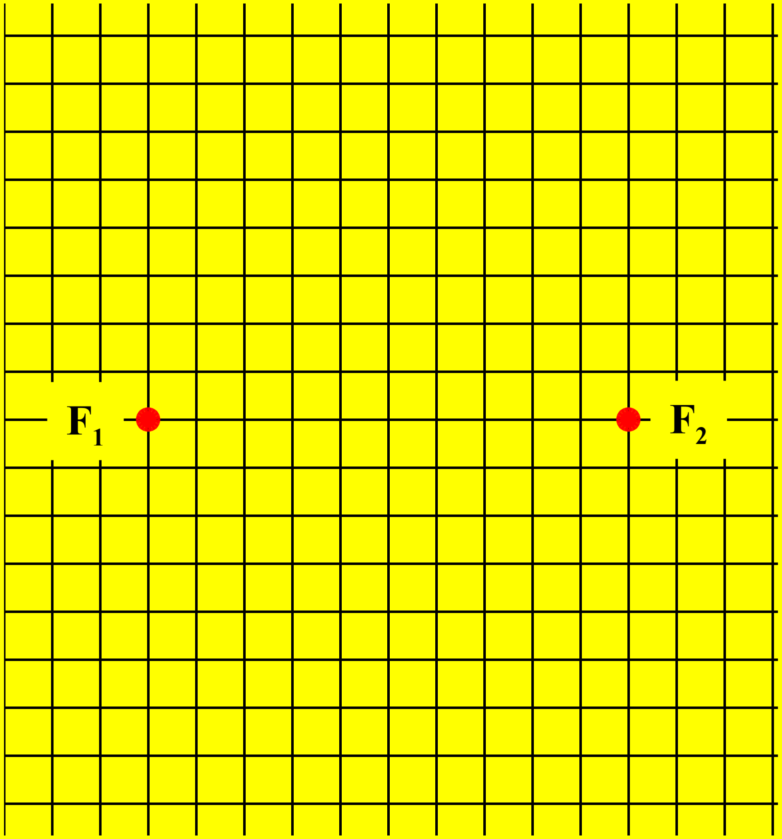
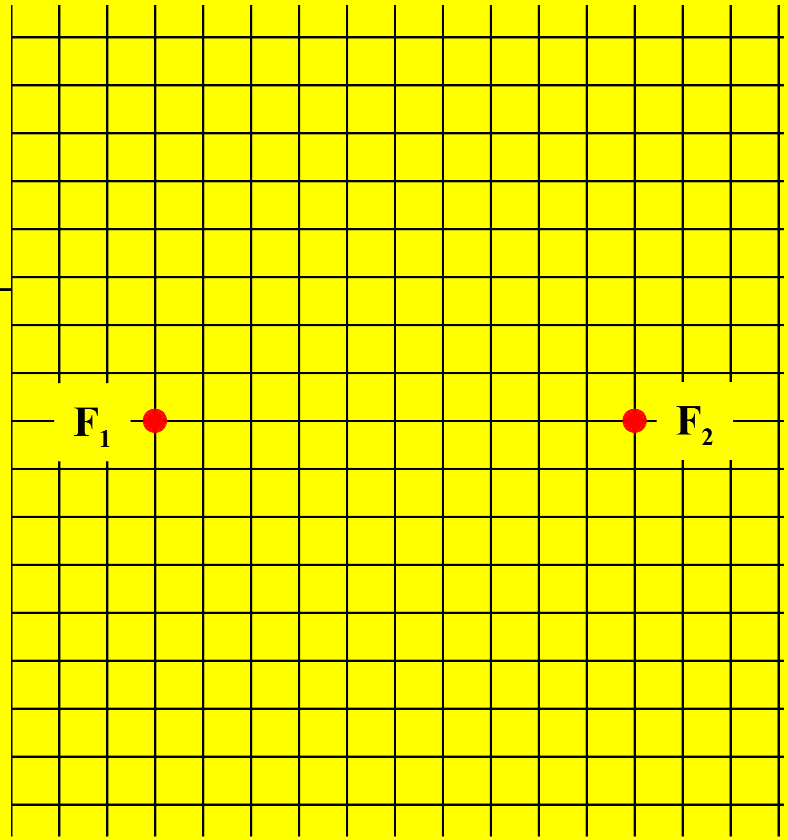


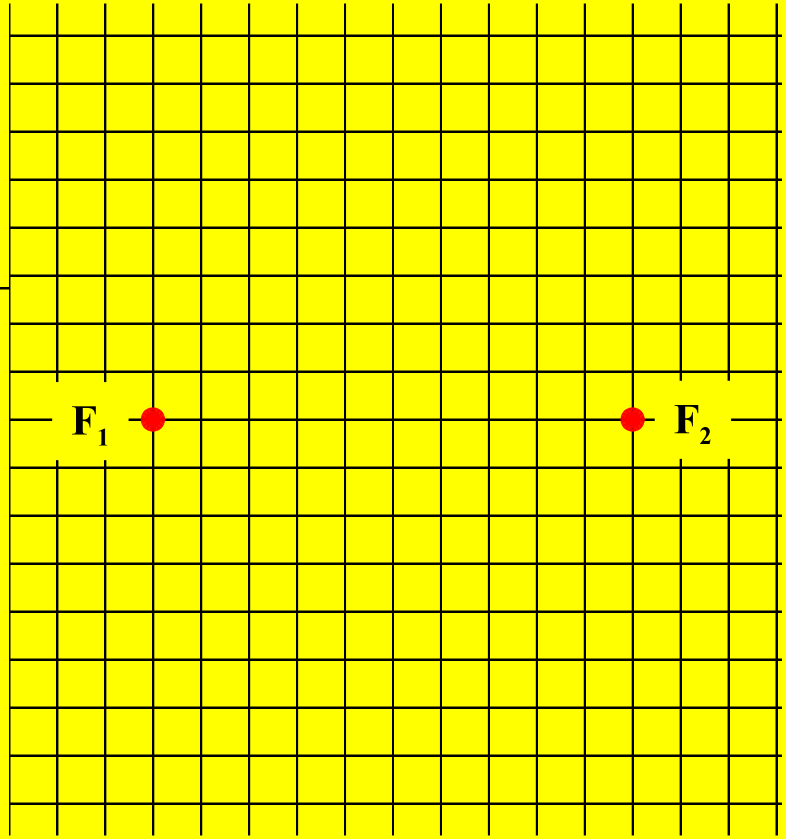
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

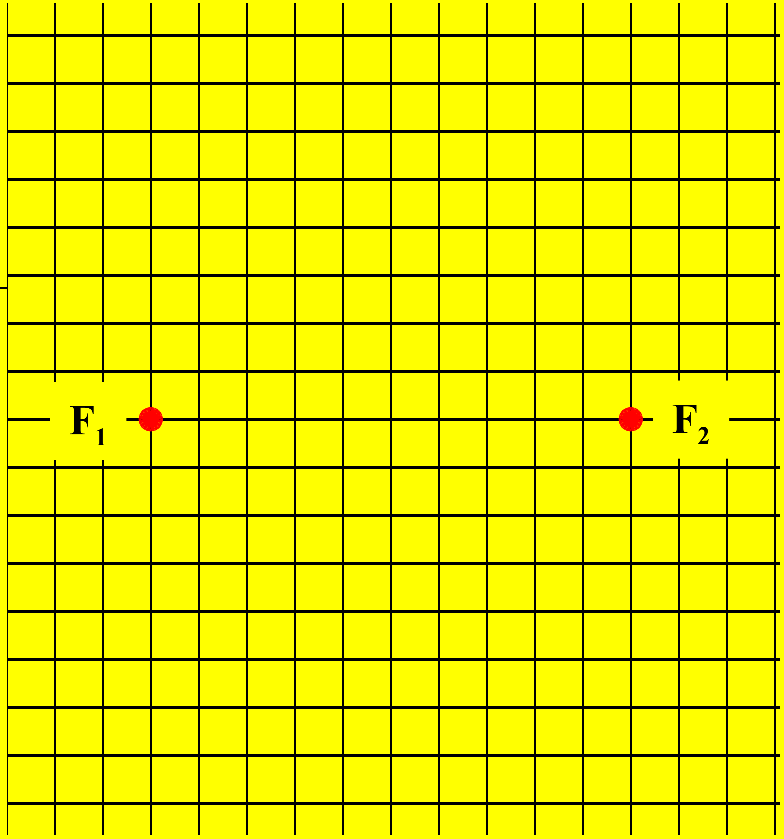
Distance From F_1	Distance From F_2
9	3



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3

The difference is 6.



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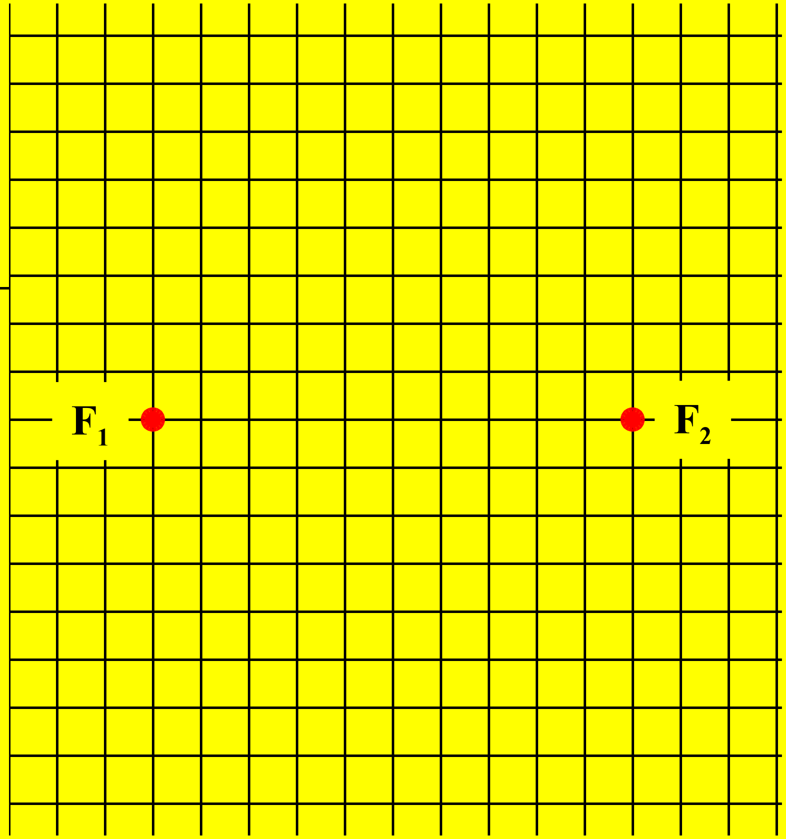
Distance From F_1	Distance From F_2
9	3



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Distance From F_1	Distance From F_2
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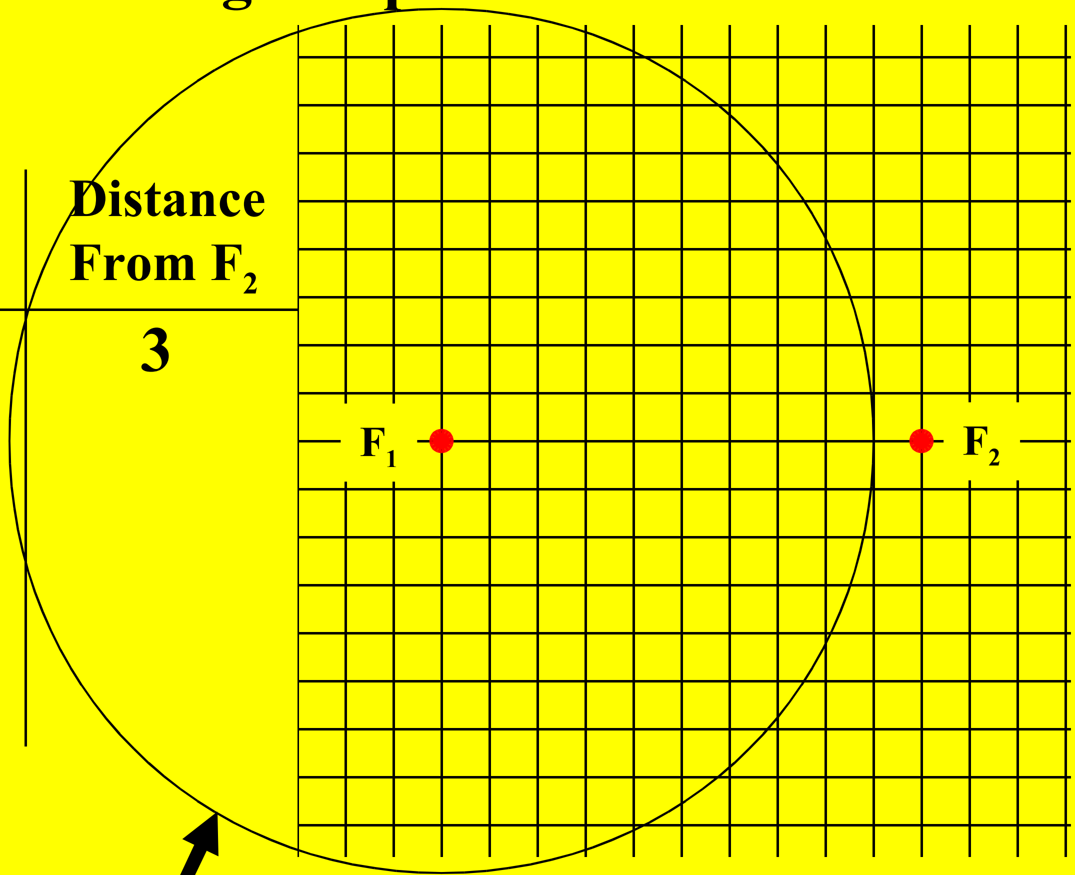
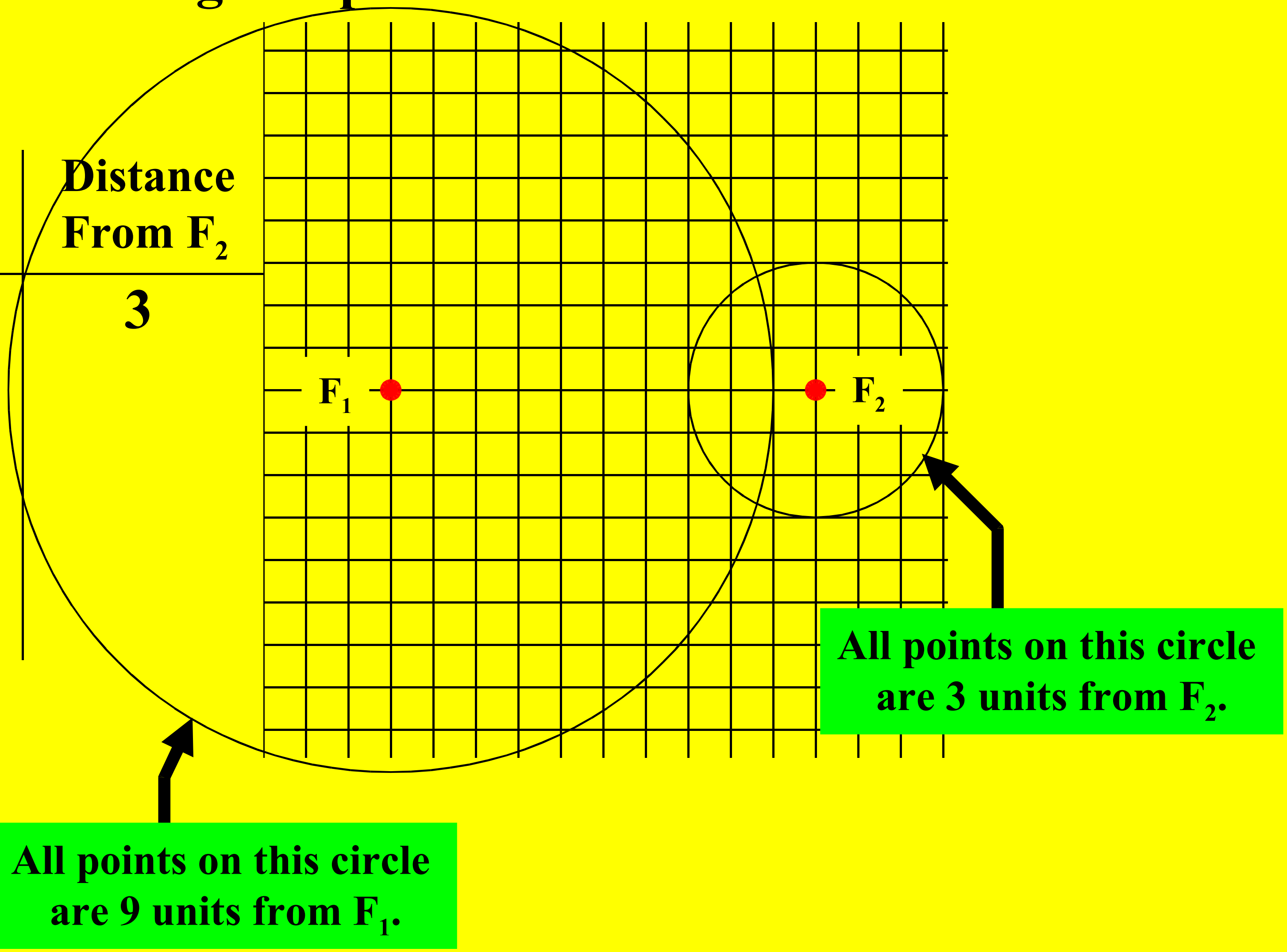


All points on this circle are 9 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3



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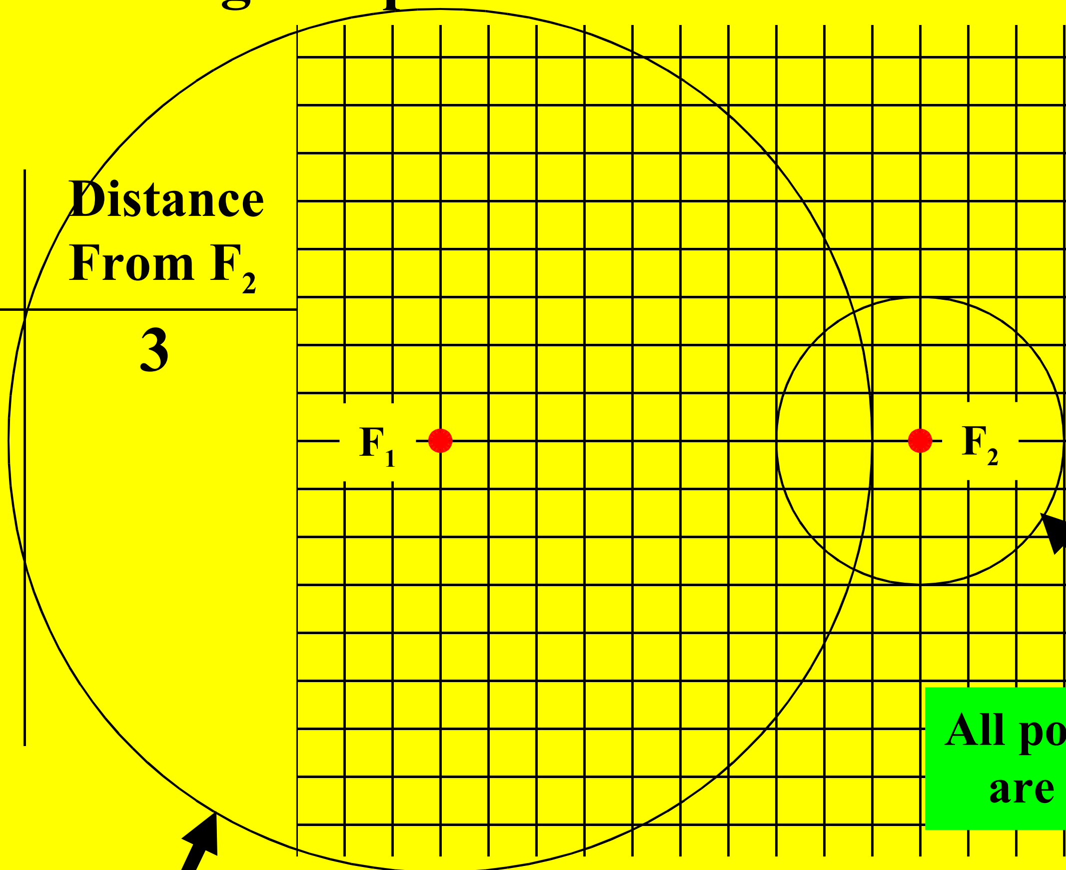
Distance From F_1	Distance From F_2
9	3



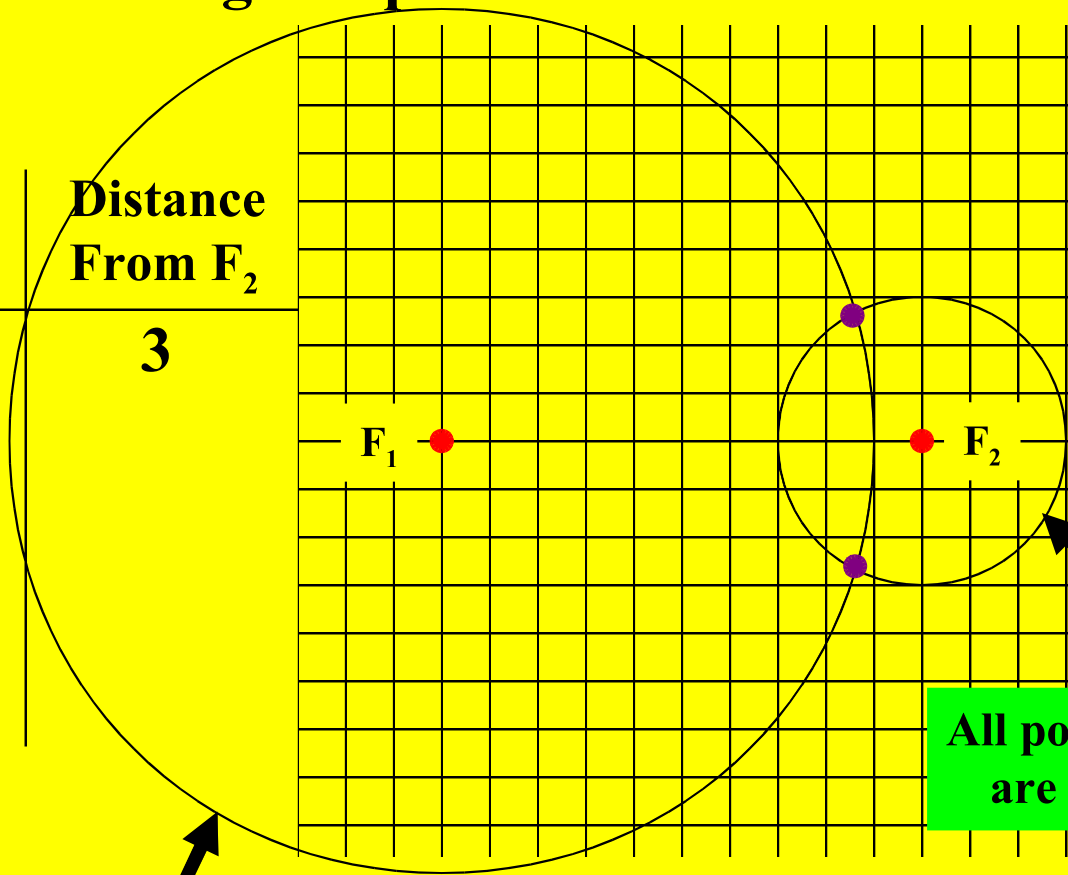
All points on this circle are 3 units from F_2.

All points on this circle are 9 units from F_1.

We need the 2 points where these circles intersect.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3



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Distance From F_1	Distance From F_2
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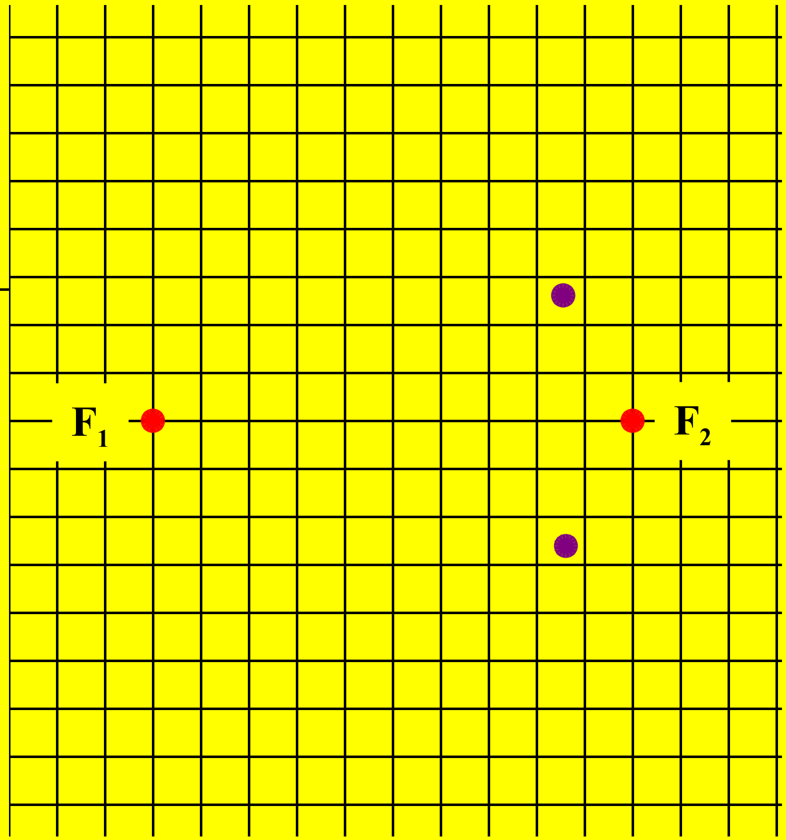
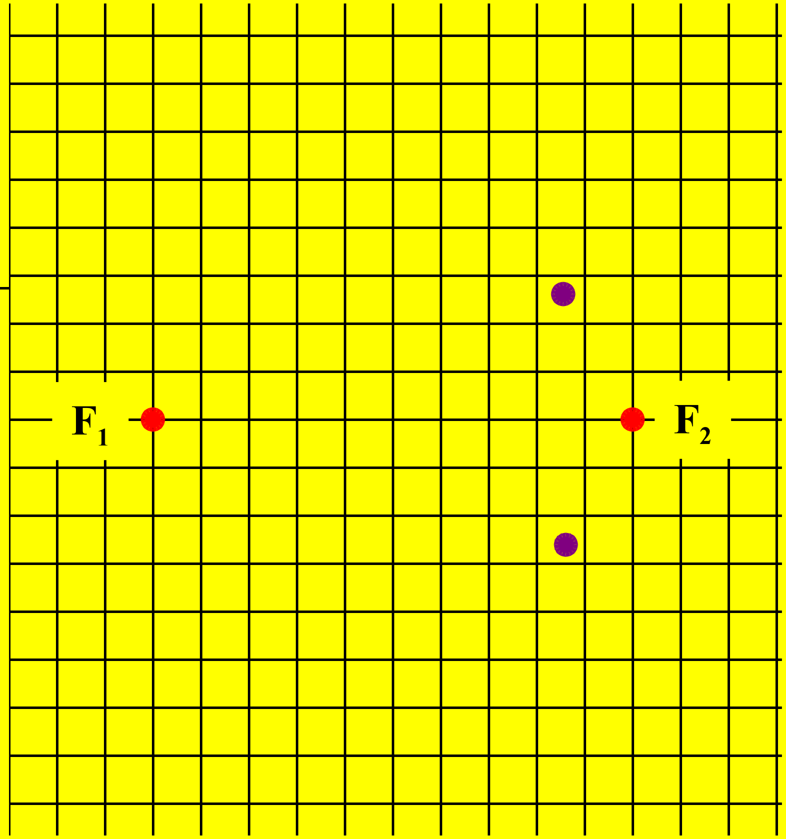


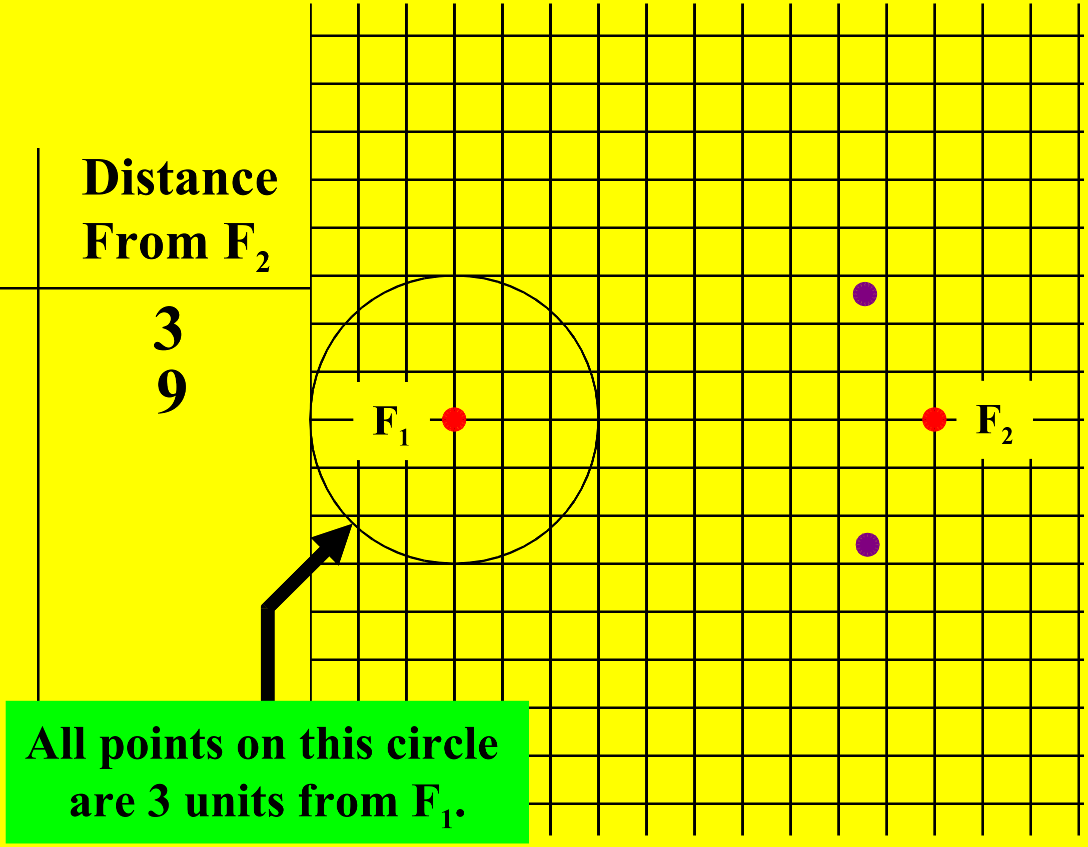
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9



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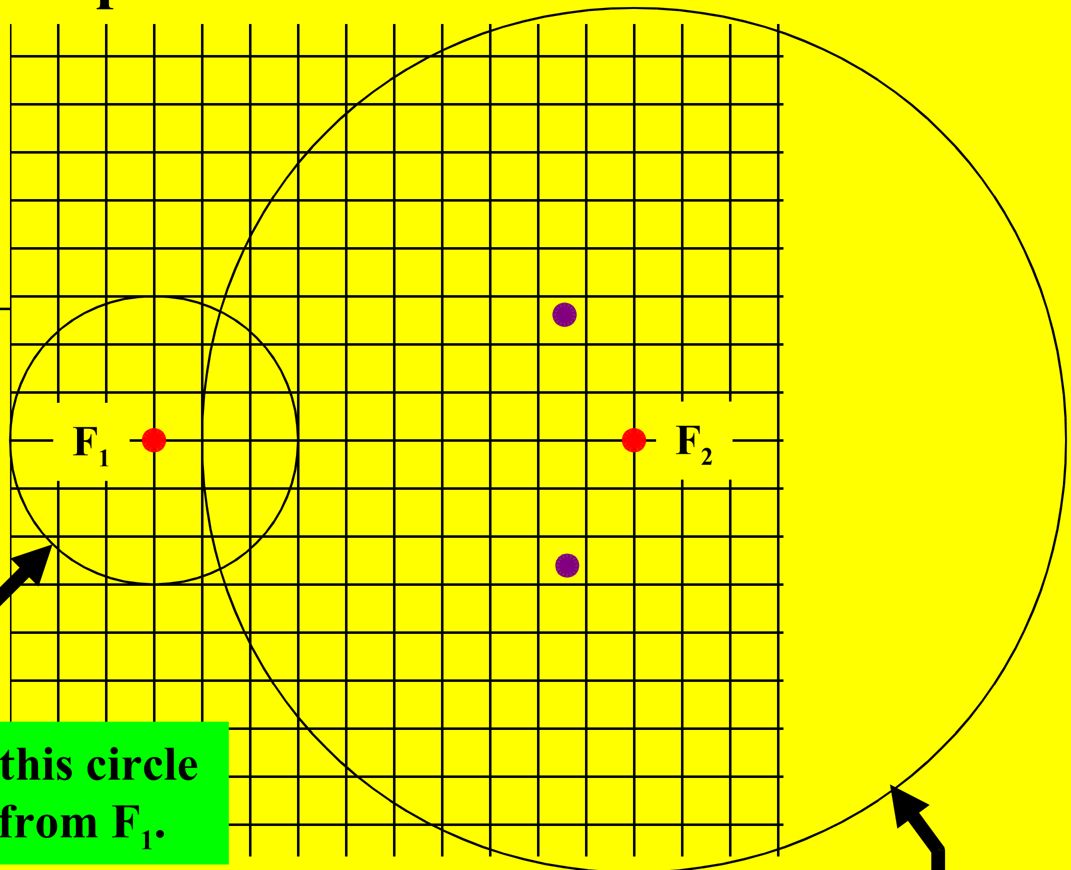
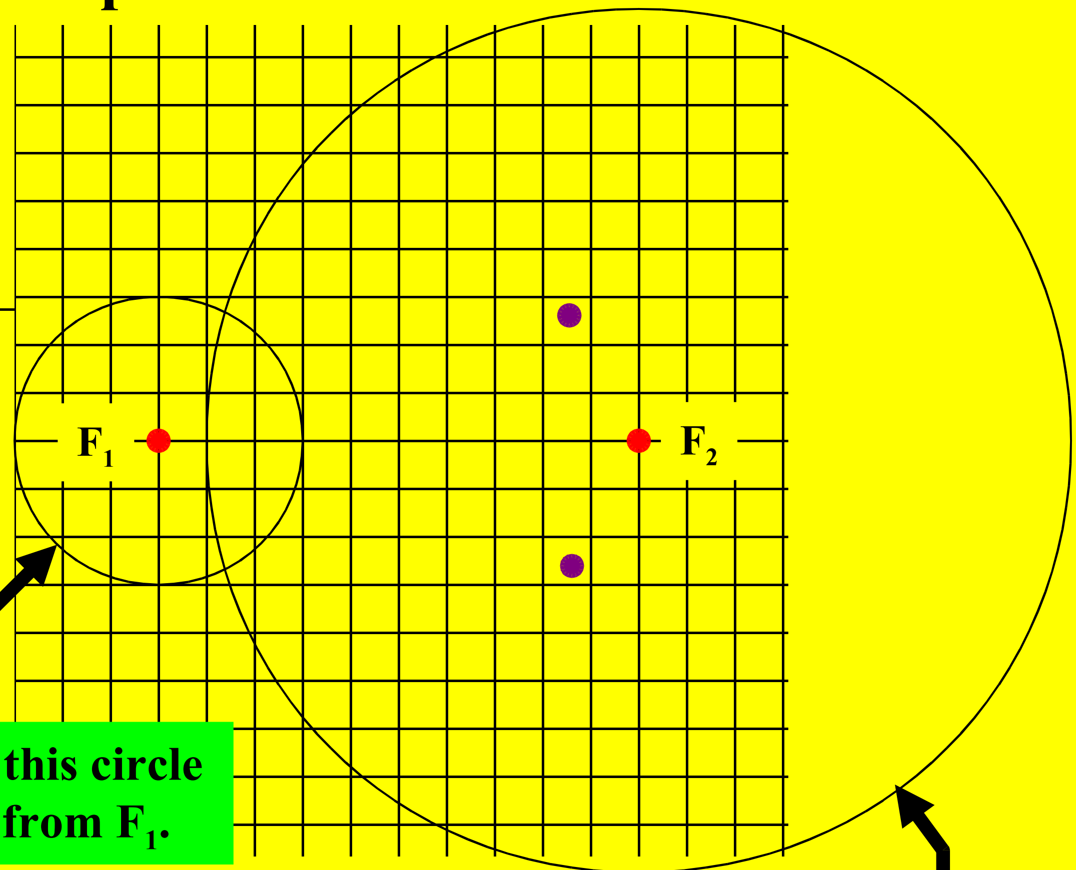
Distance From F_1	Distance From F_2
9	3
3	9



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9



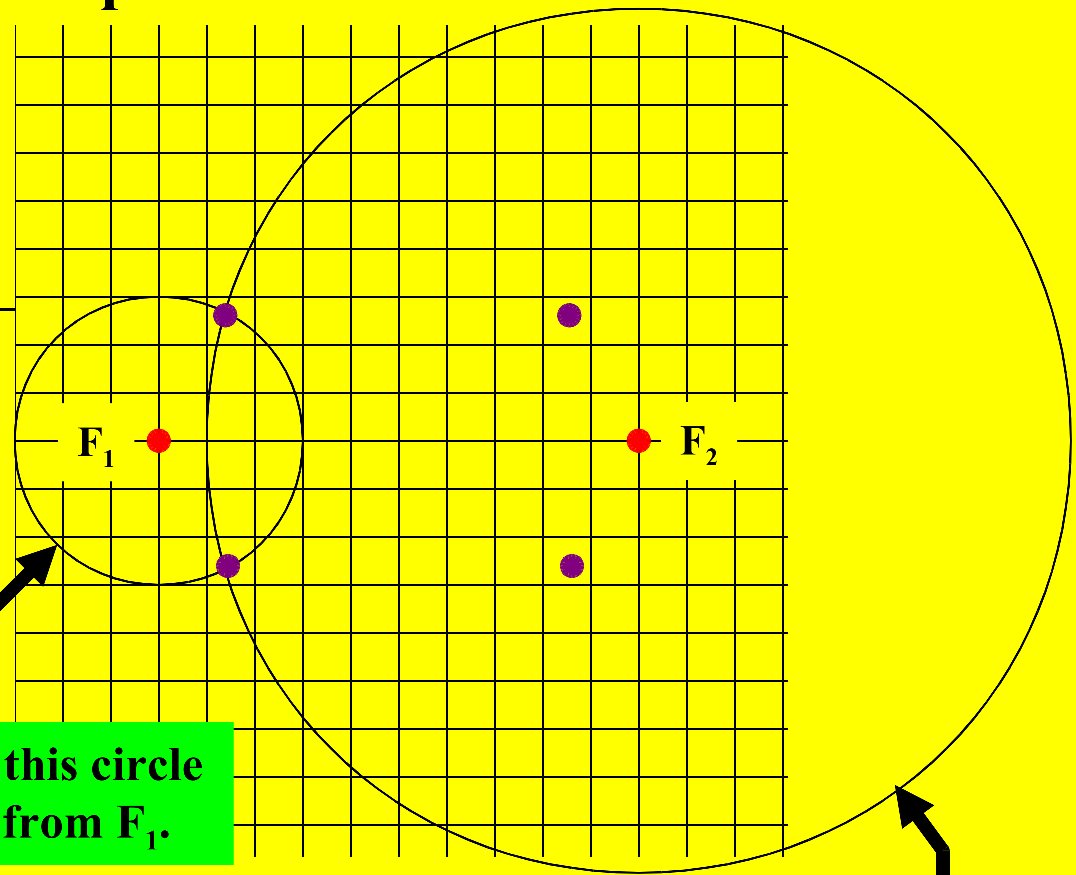
All points on this circle are 3 units from F_1.

We need the 2 points where these circles intersect.

All points on this circle are 9 units from F_2.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9



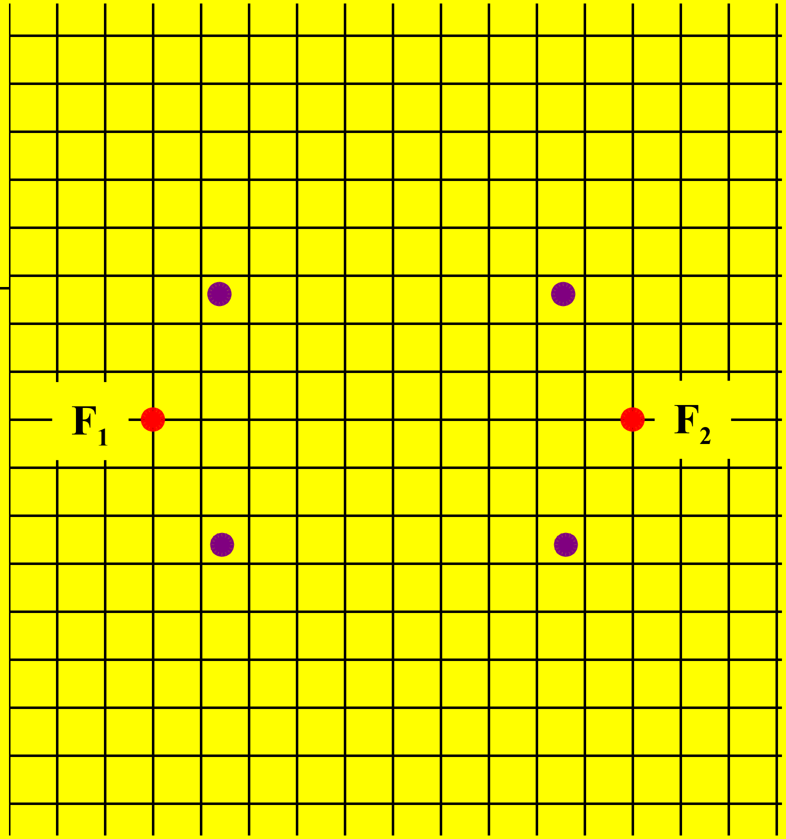
All points on this circle are 3 units from F_1.

We need the 2 points where these circles intersect.

All points on this circle are 9 units from F_2.

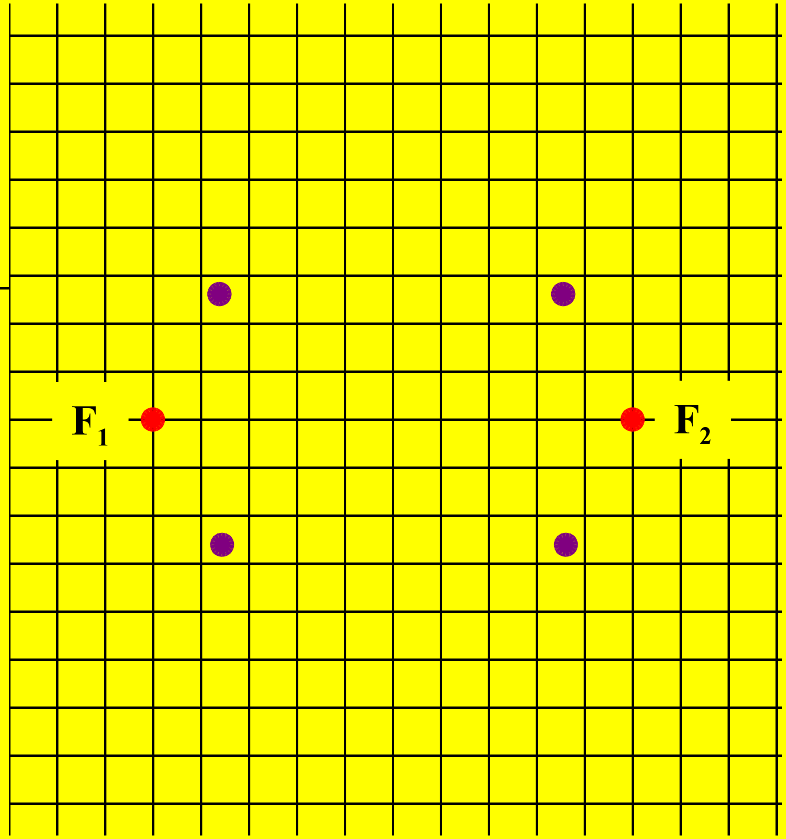
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9



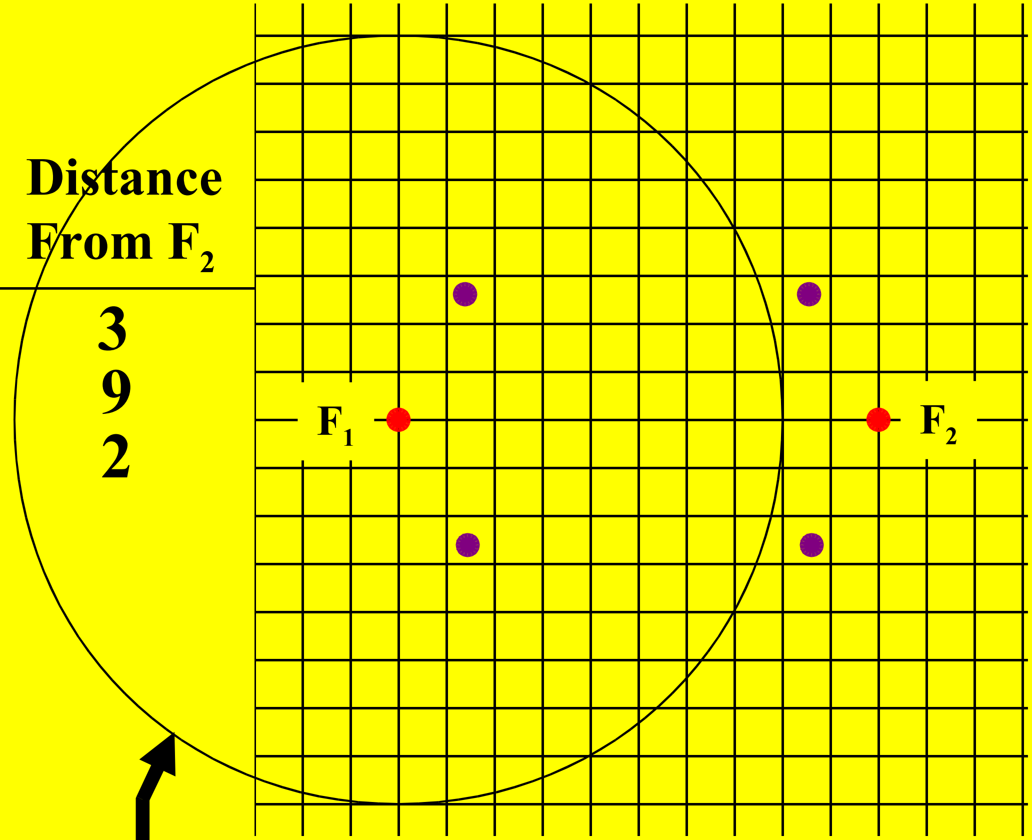
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

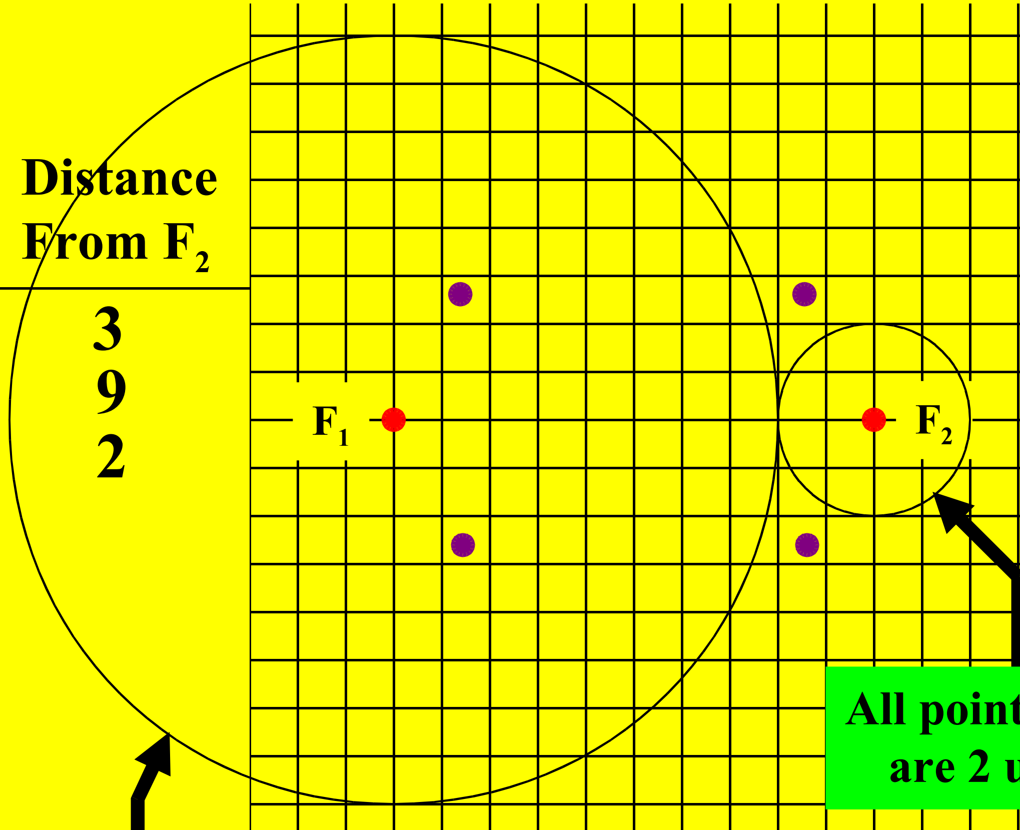
Distance From F_1	Distance From F_2
9	3
3	9
8	2



All points on this circle are 8 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2

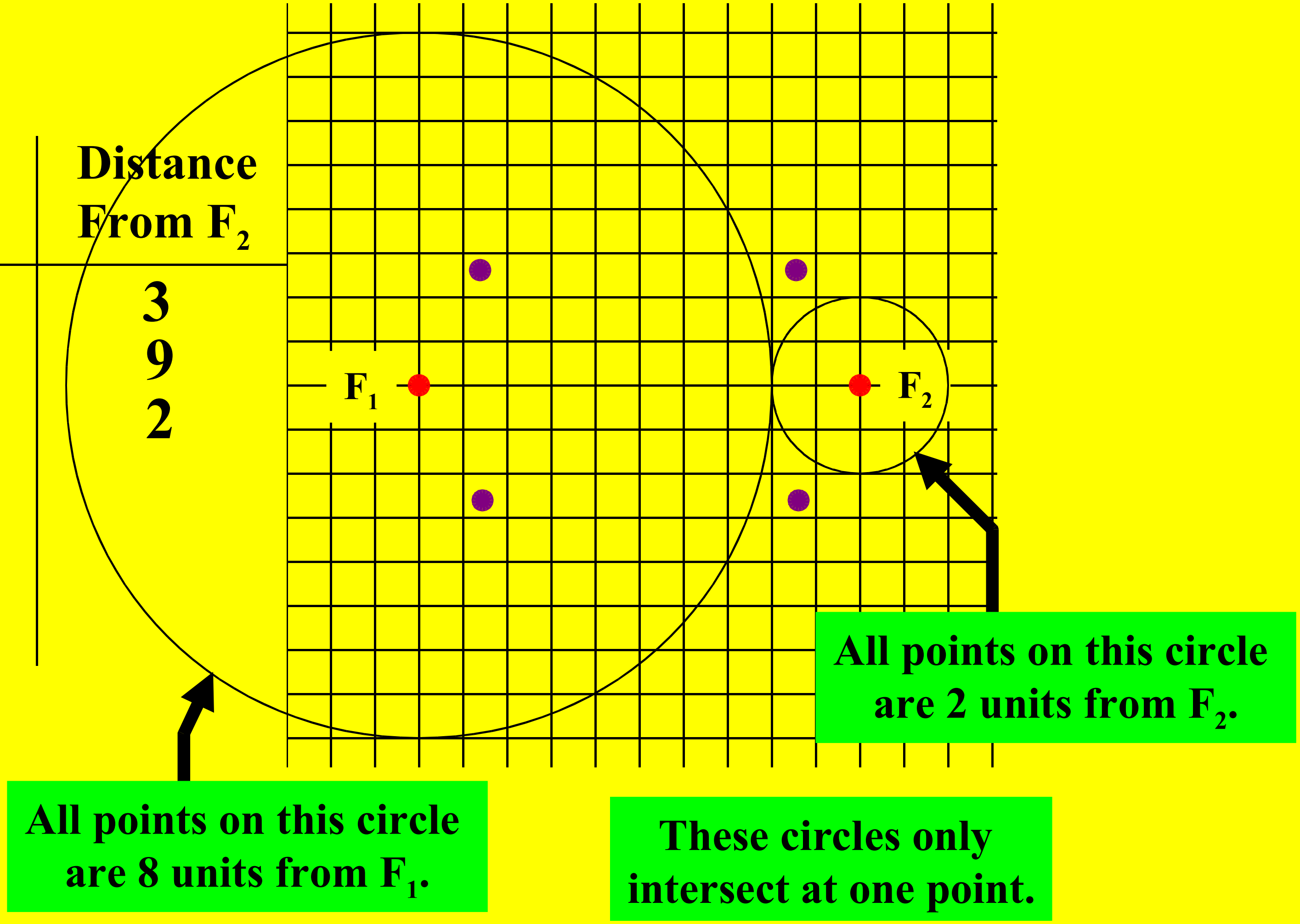


All points on this circle are 2 units from F_2.

All points on this circle are 8 units from F_1.

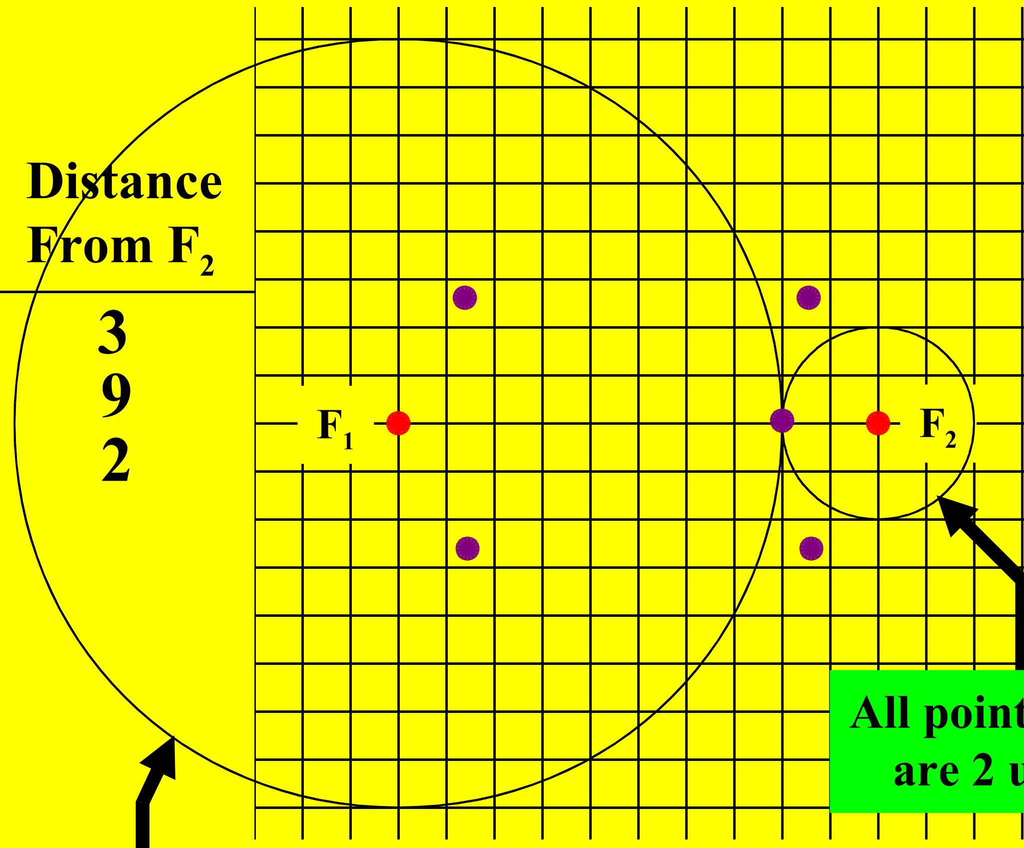
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2



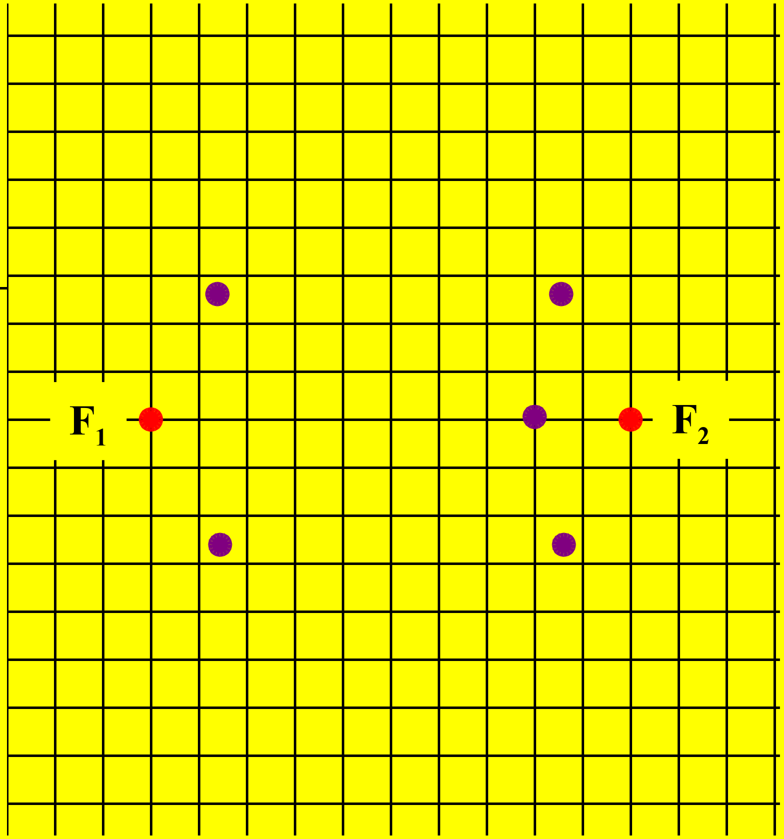
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2



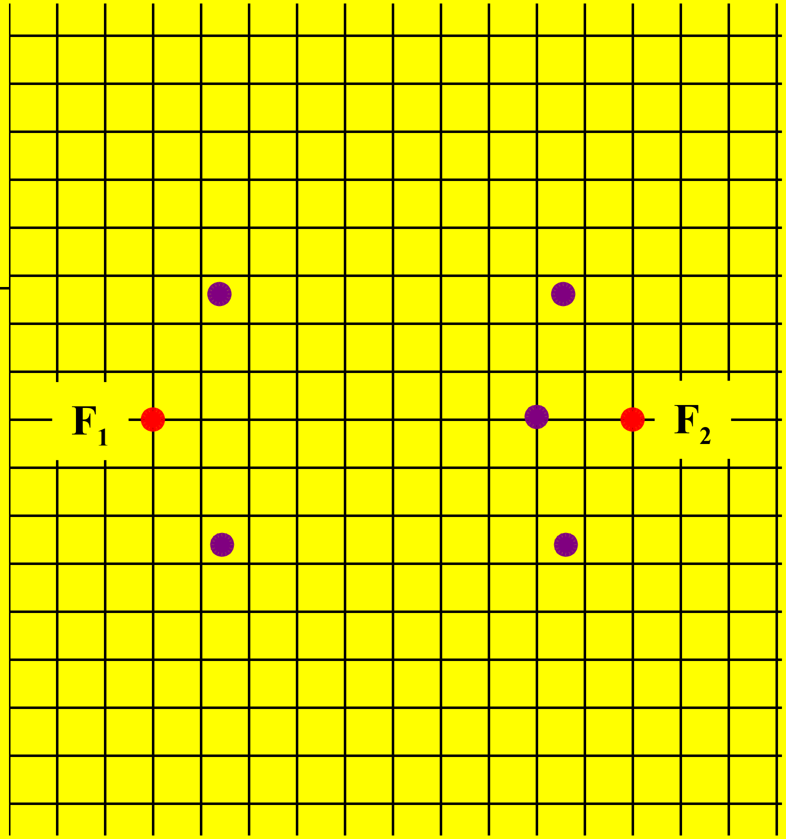
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2



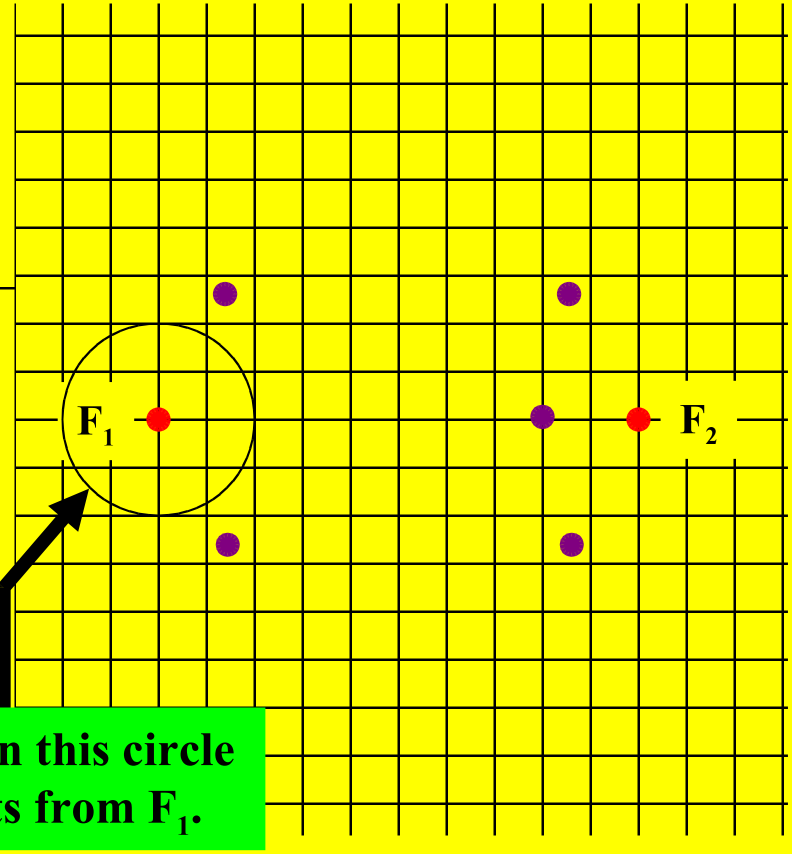
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8



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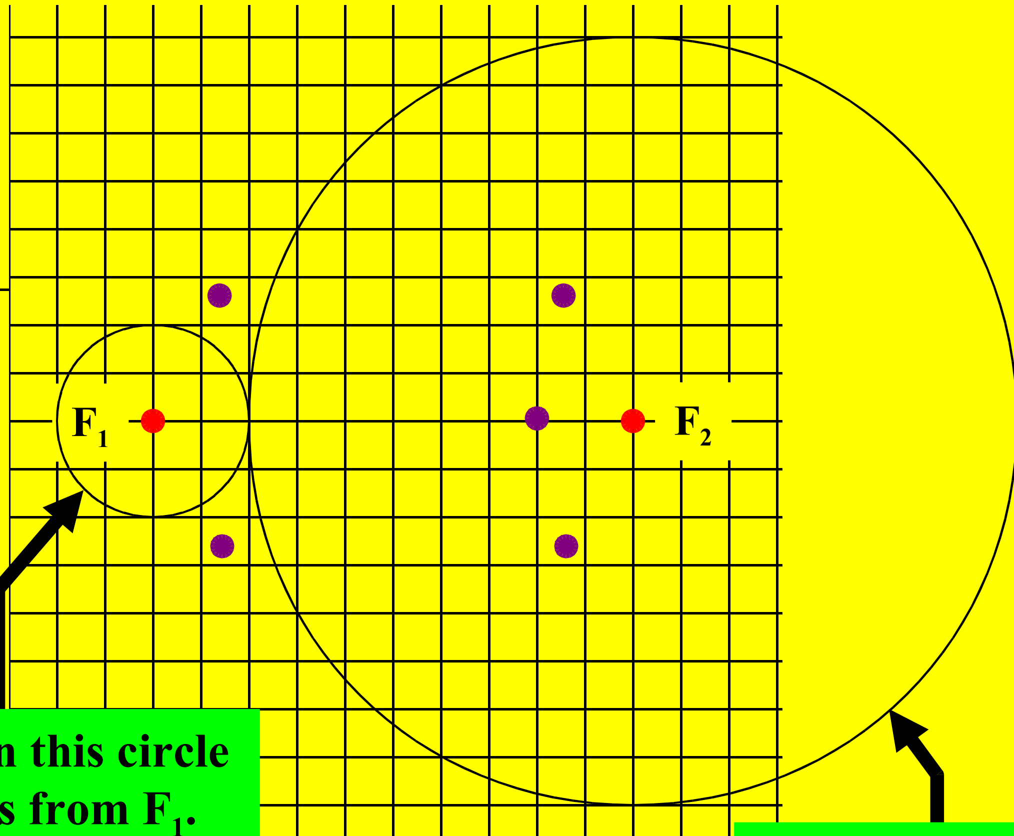
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8

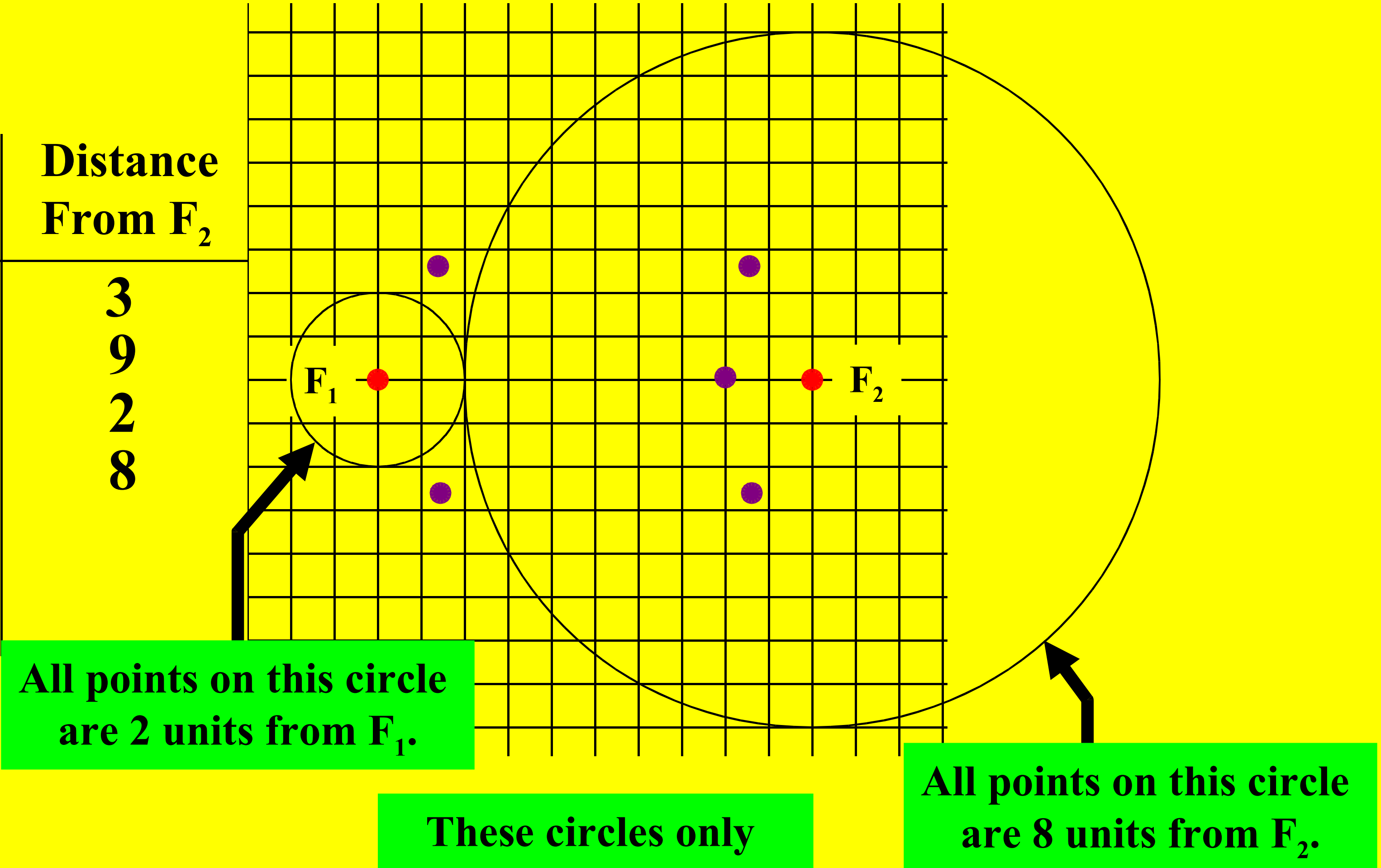


All points on this circle are 2 units from F_1.

All points on this circle are 8 units from F_2.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

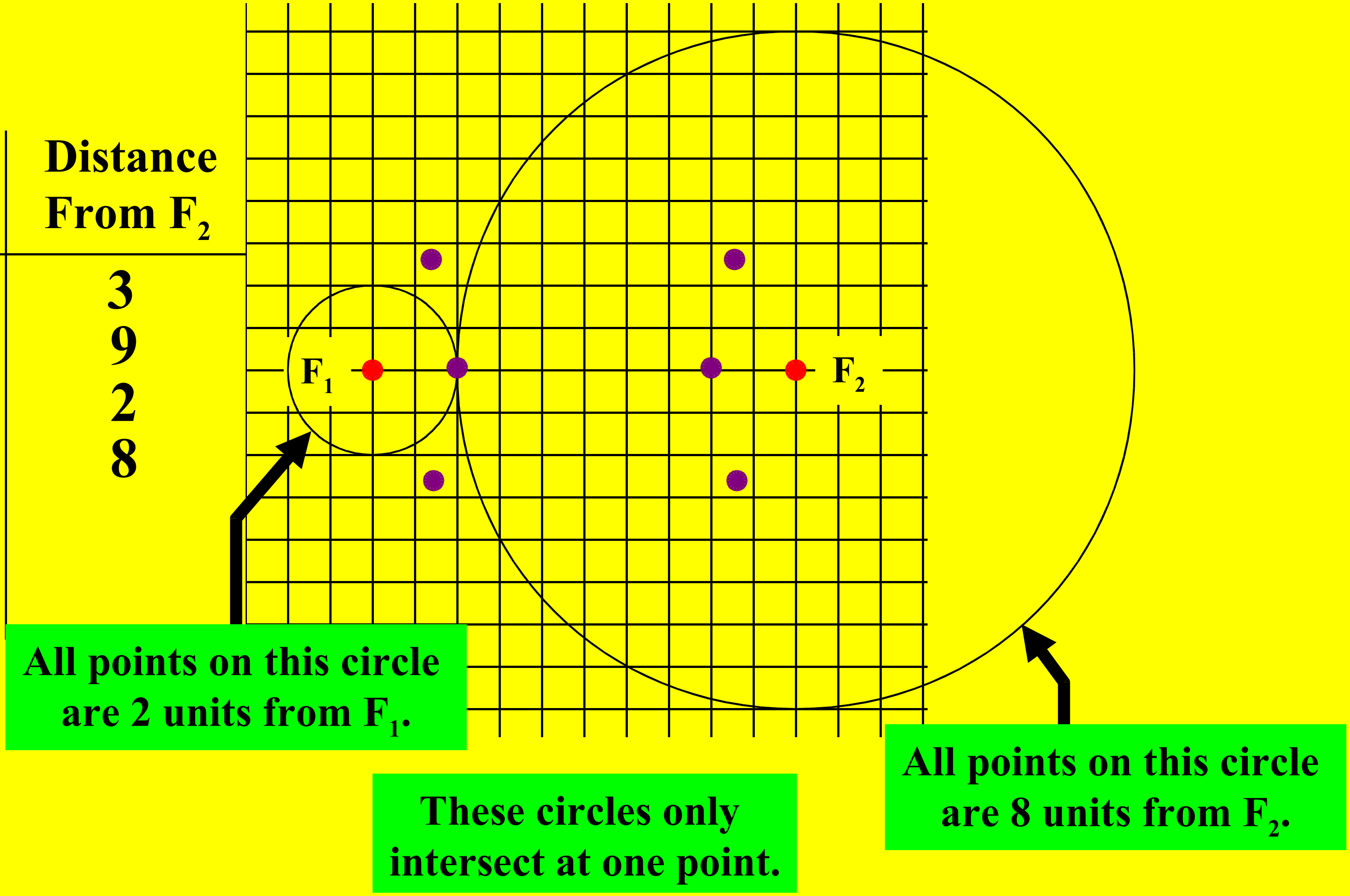
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8



These circles only intersect at one point.

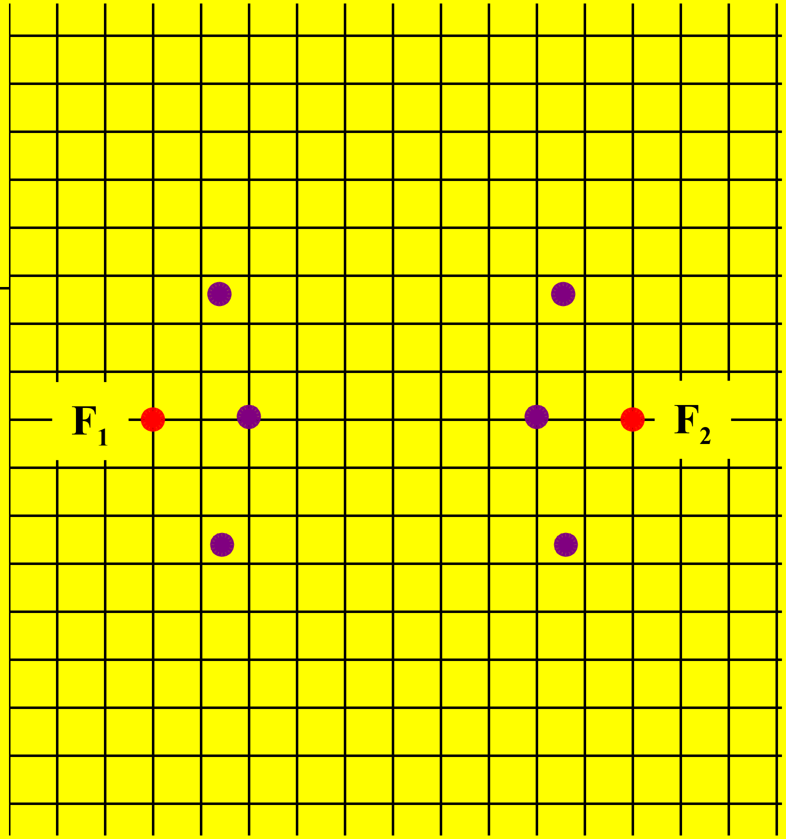
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8



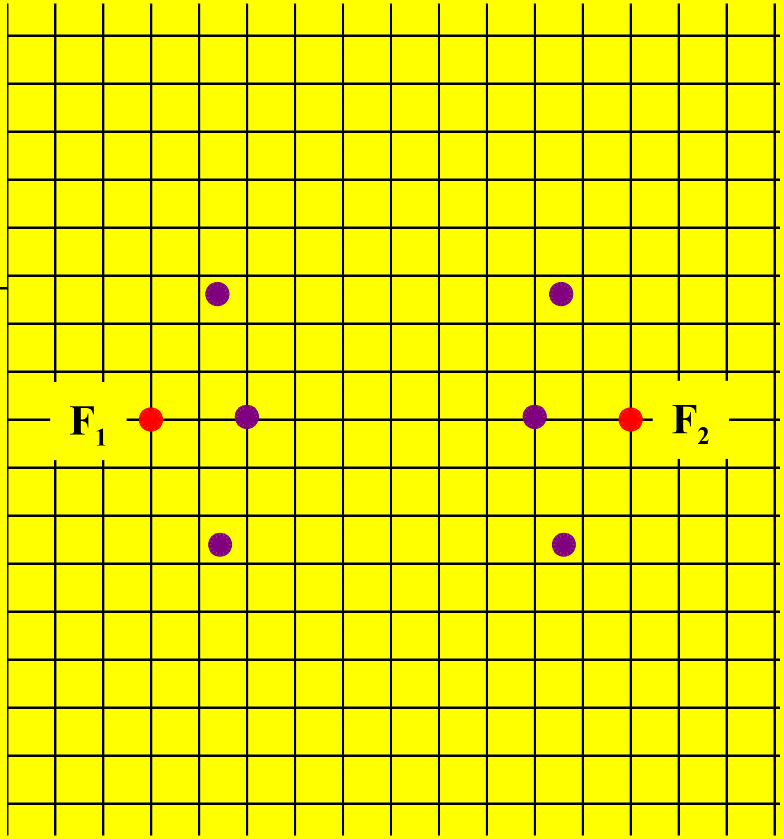
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8



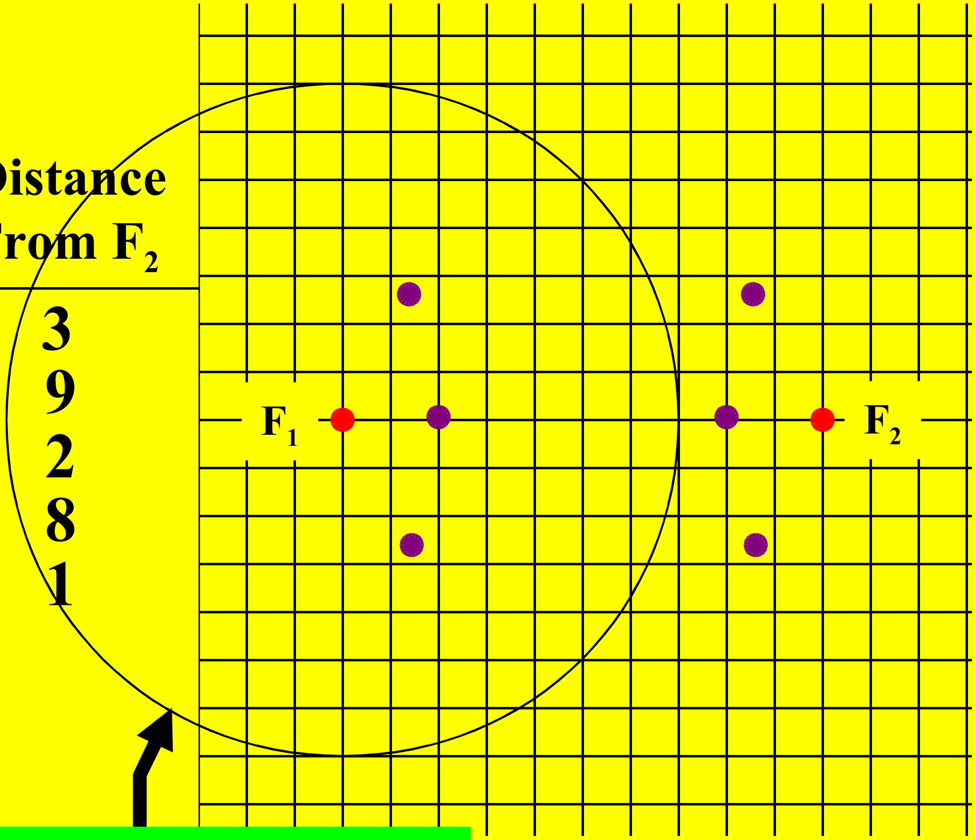
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
7	1



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

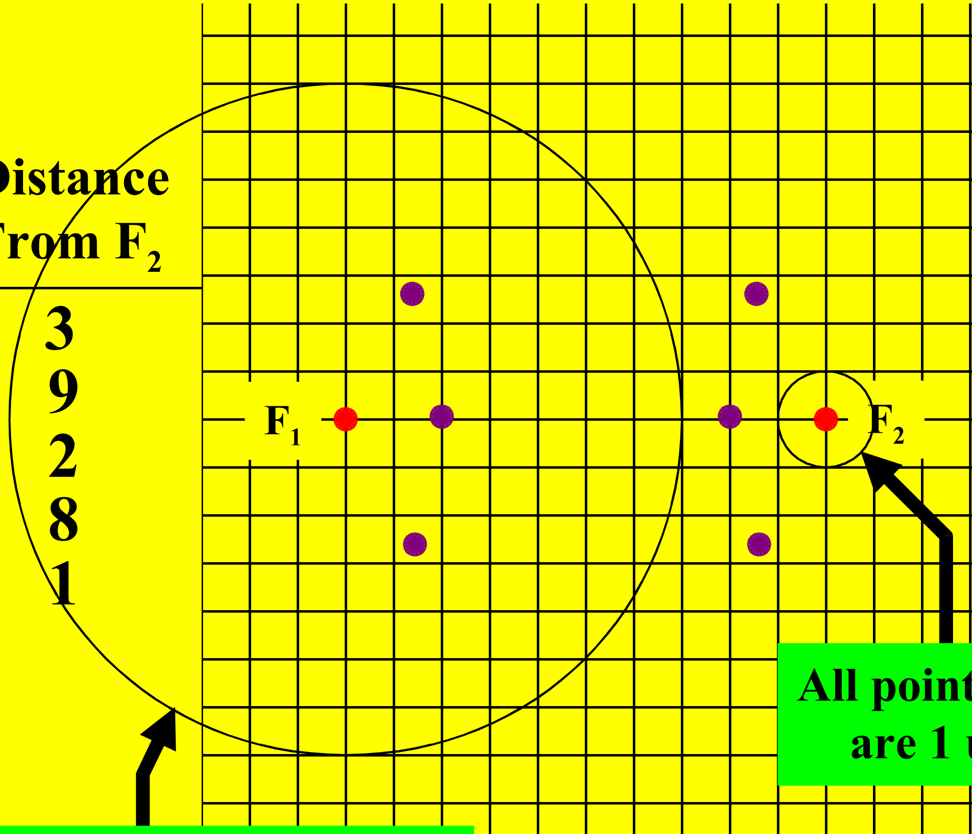
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
7	1



All points on this circle are 7 units from F_1.

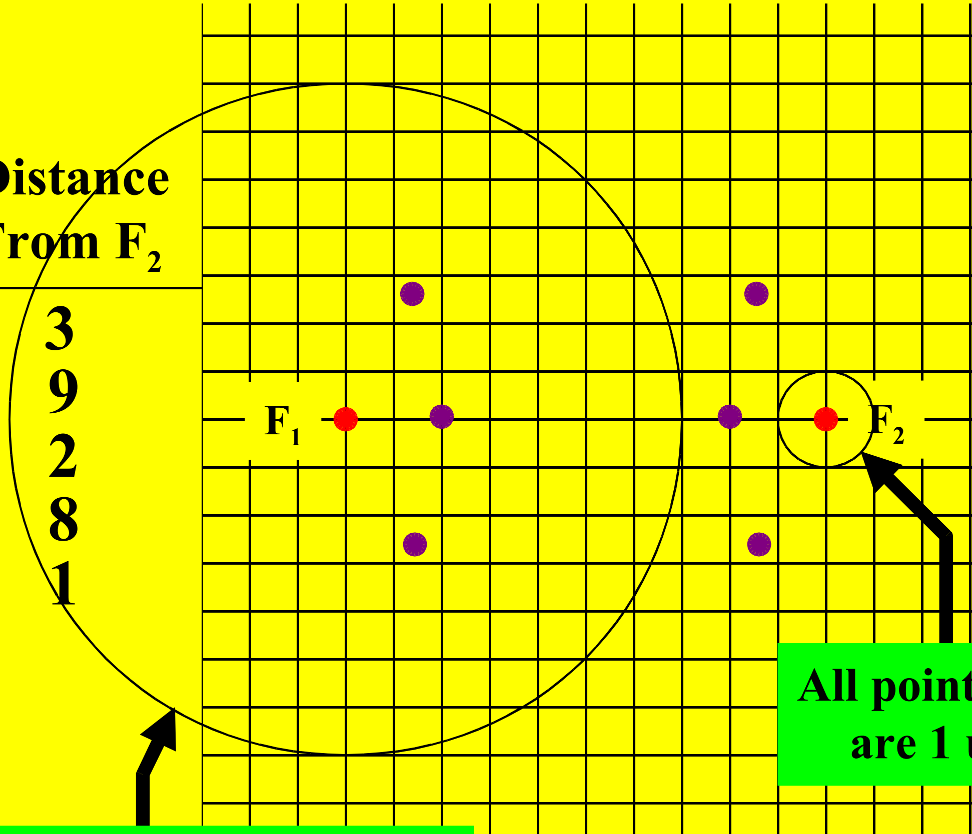
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
7	1



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
7	1



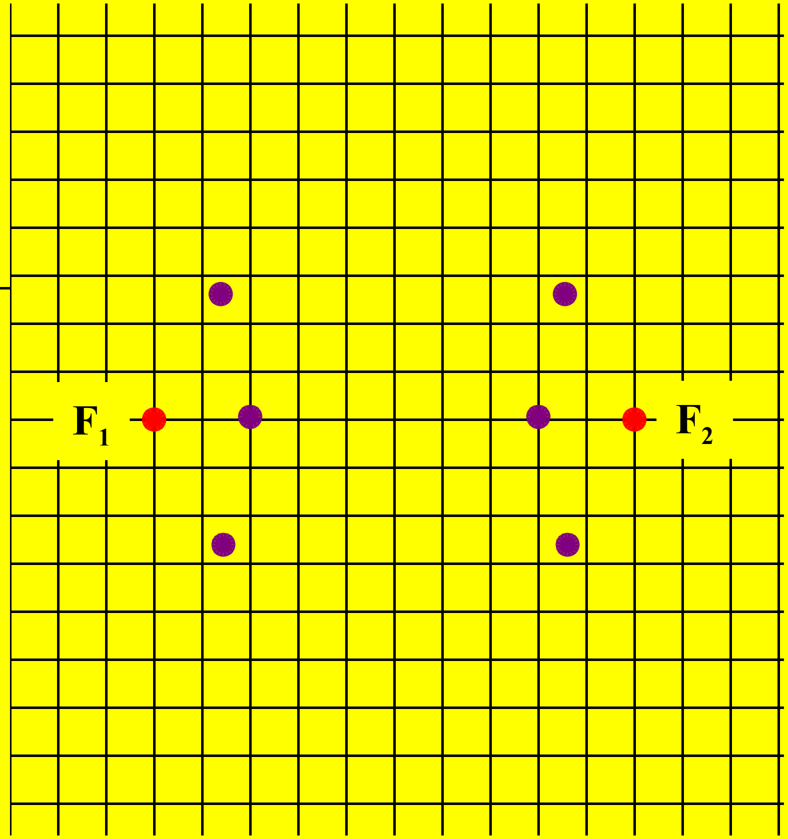
All points on this circle are 1 unit from F_2.

All points on this circle are 7 units from F_1.

These circles do not intersect !

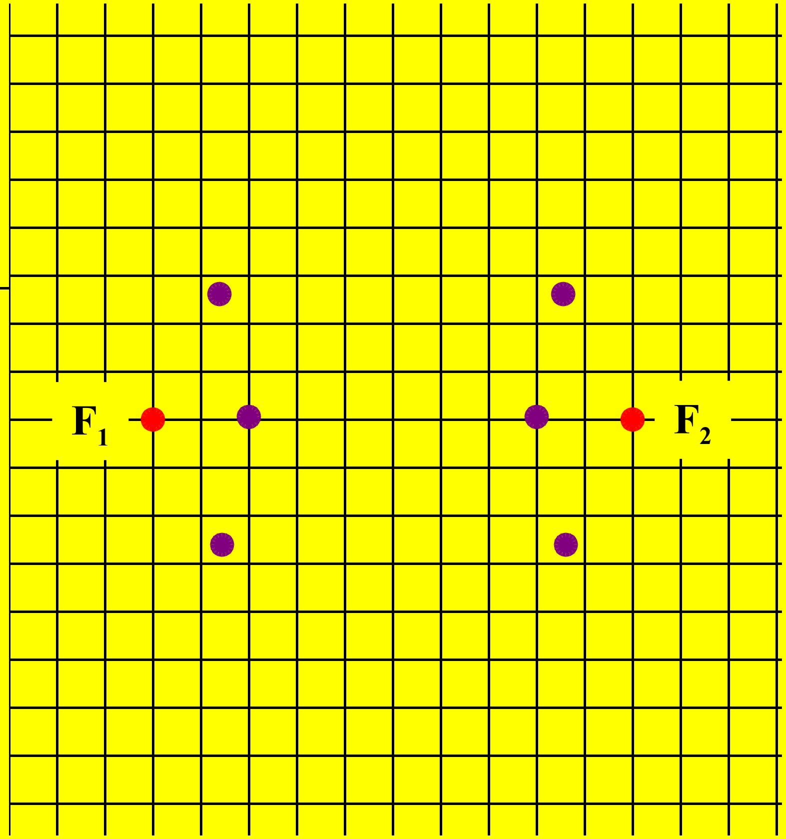
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8



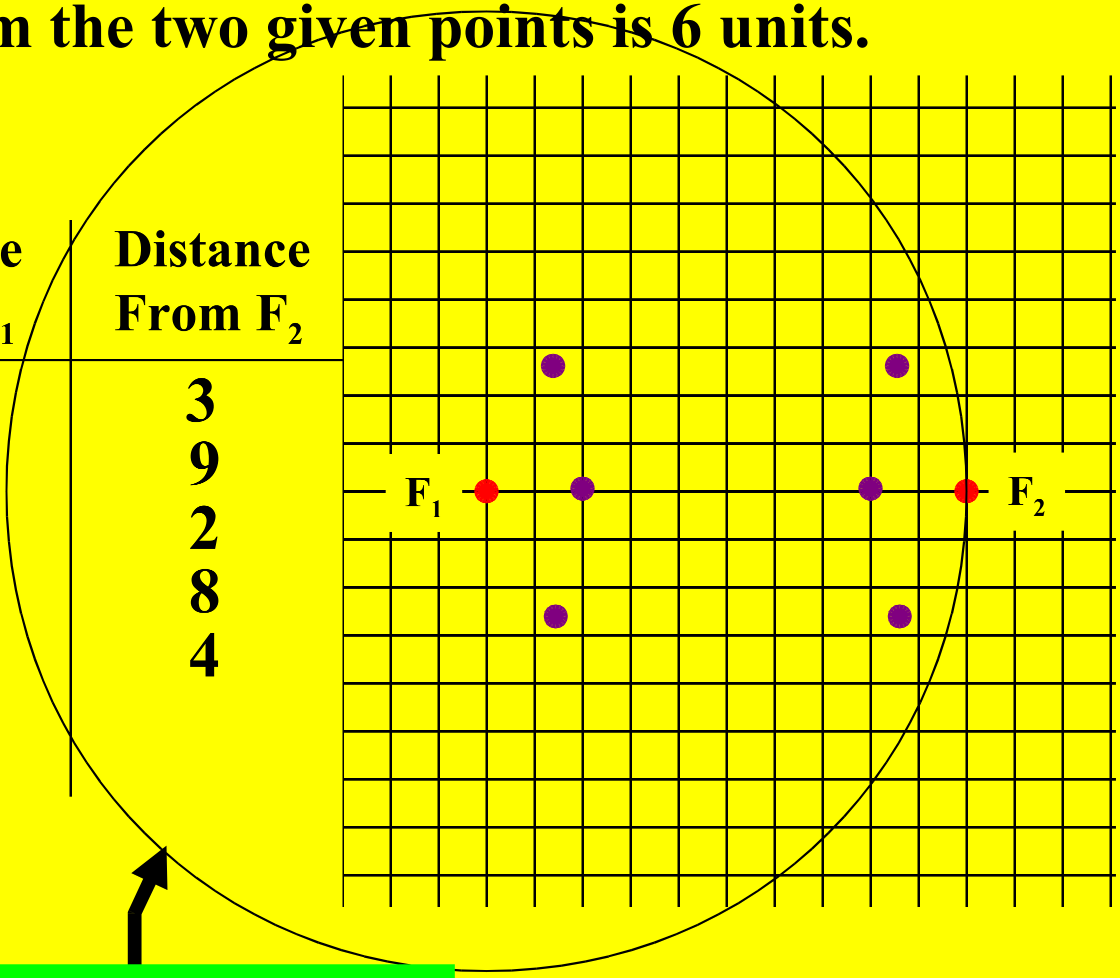
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

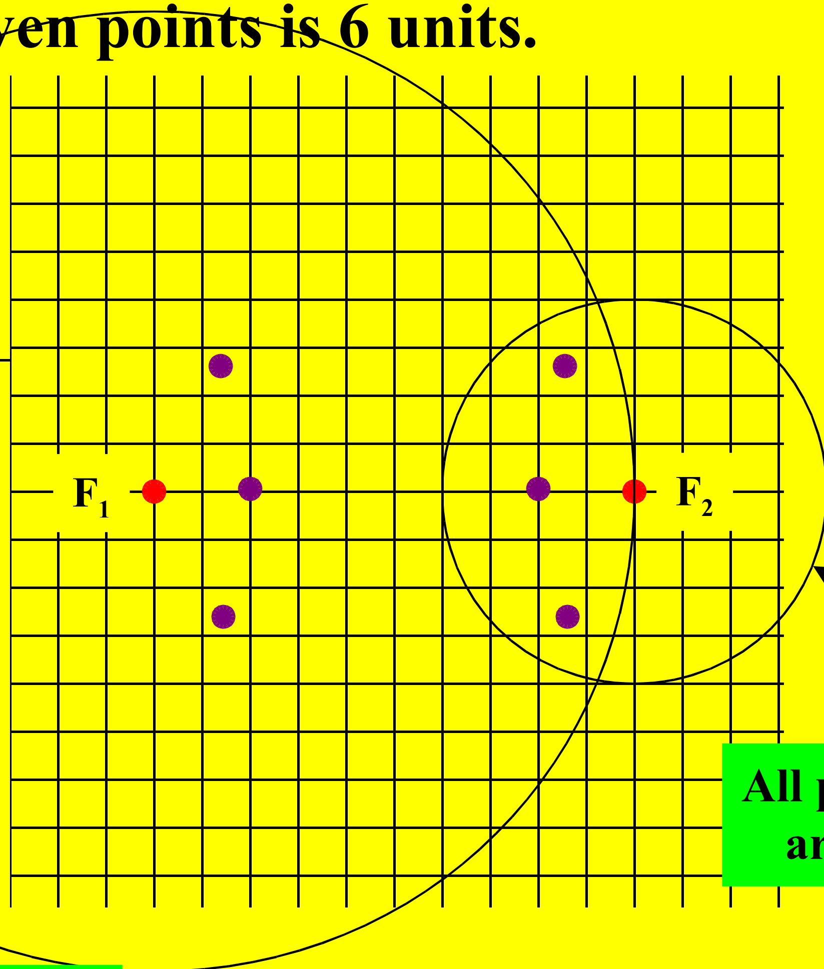
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4



All points on this circle are 10 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4

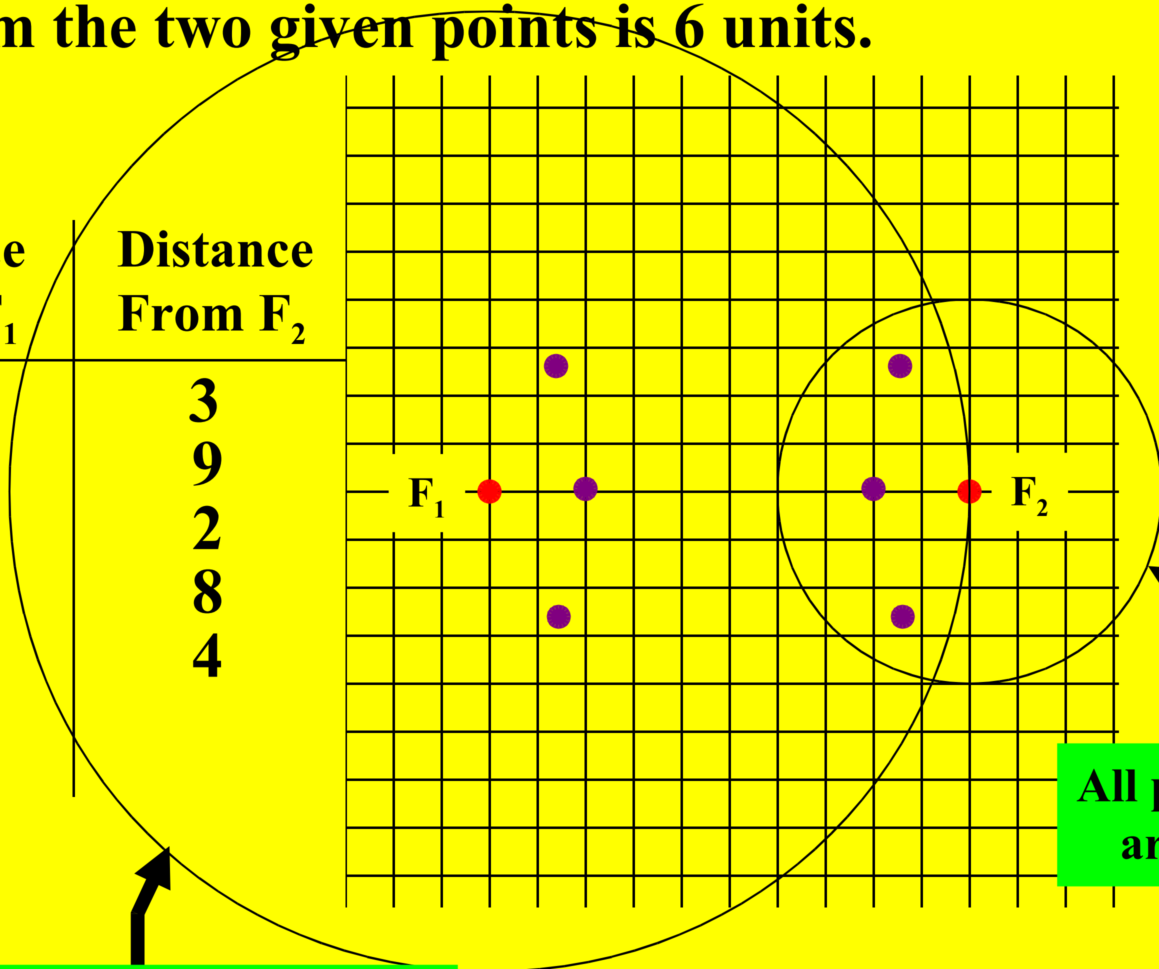


All points on this circle are 4 units from F_2.

All points on this circle are 10 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4



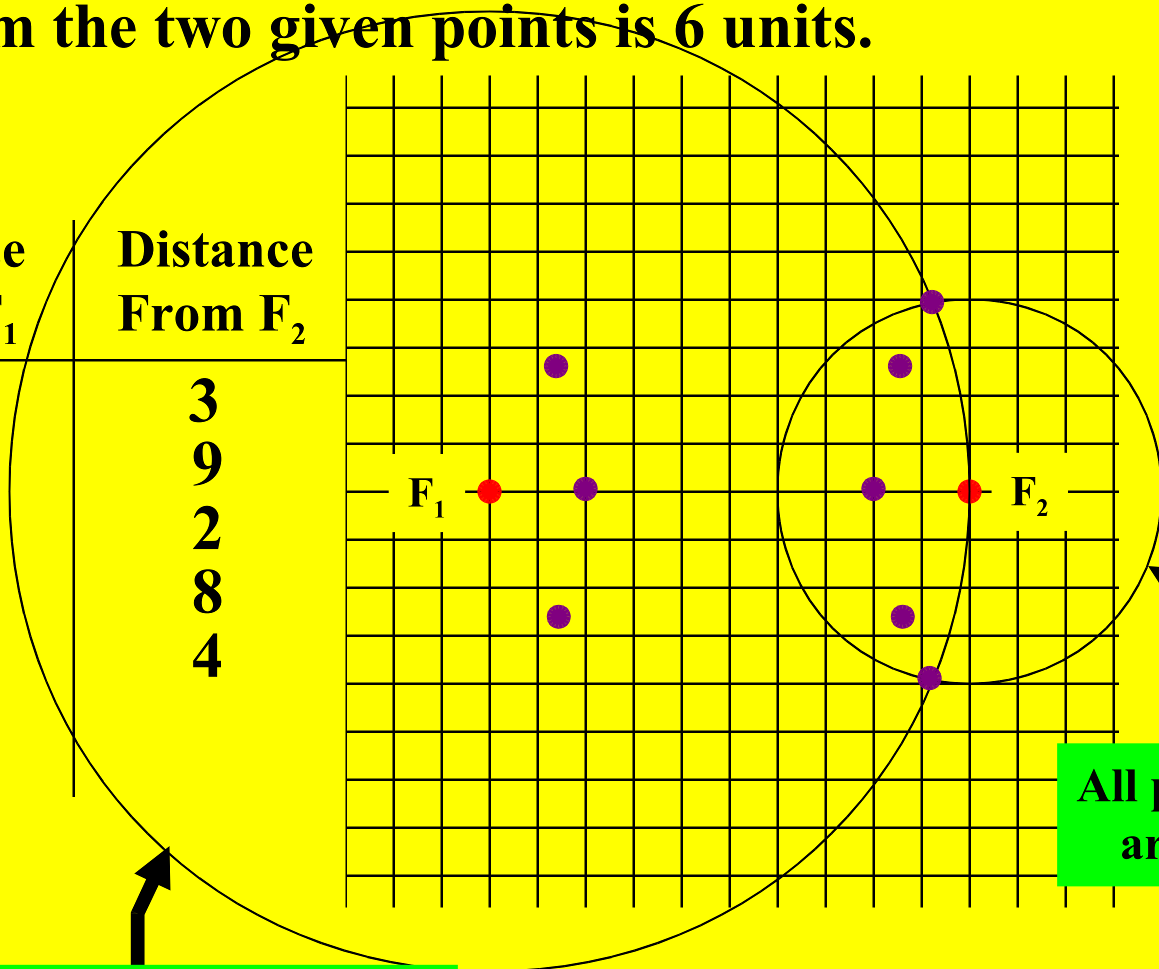
All points on this circle are 4 units from F_2.

All points on this circle are 10 units from F_1.

We need the 2 points where these circles intersect.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4



All points on this circle are 4 units from F_2.

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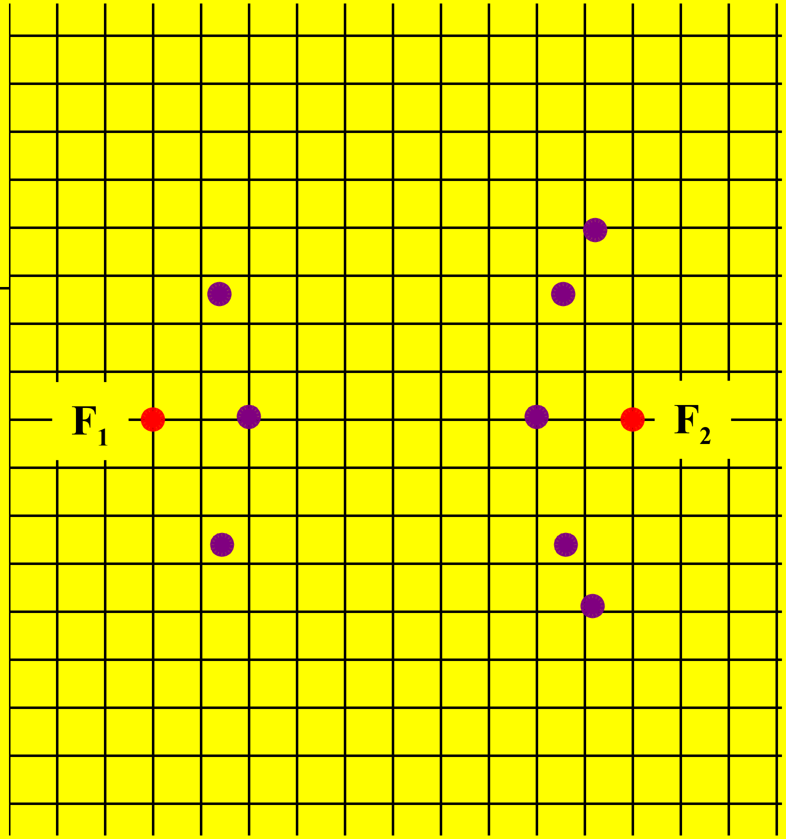
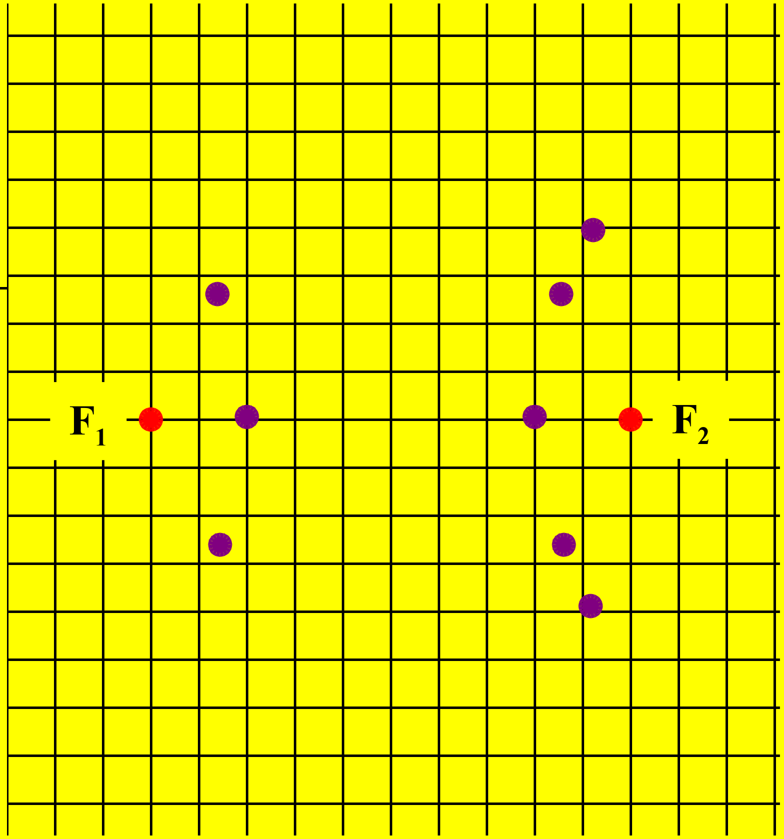
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4



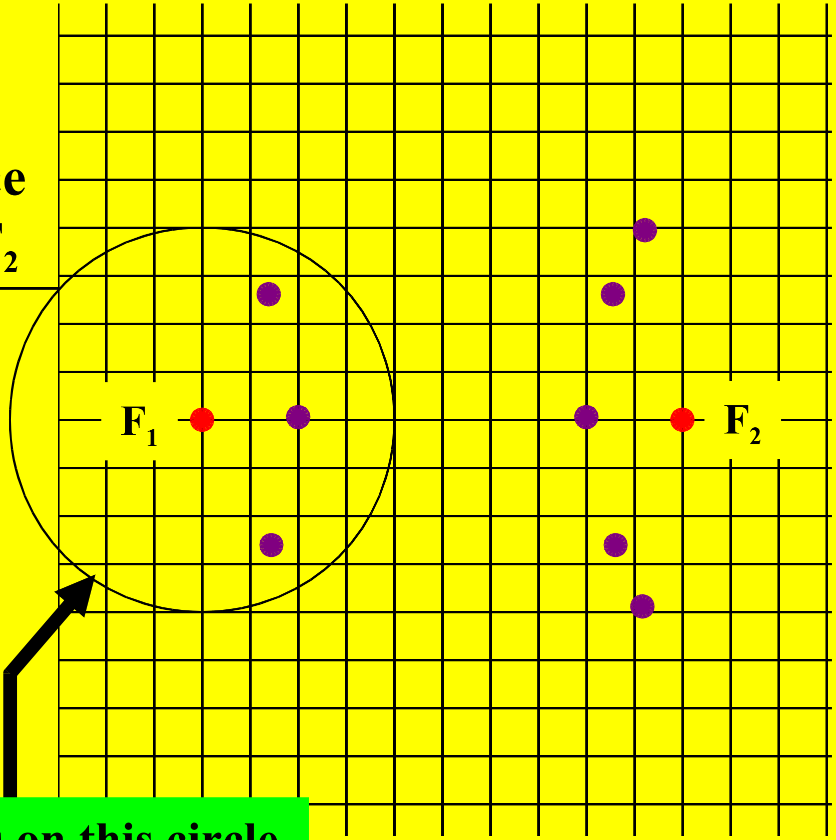
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

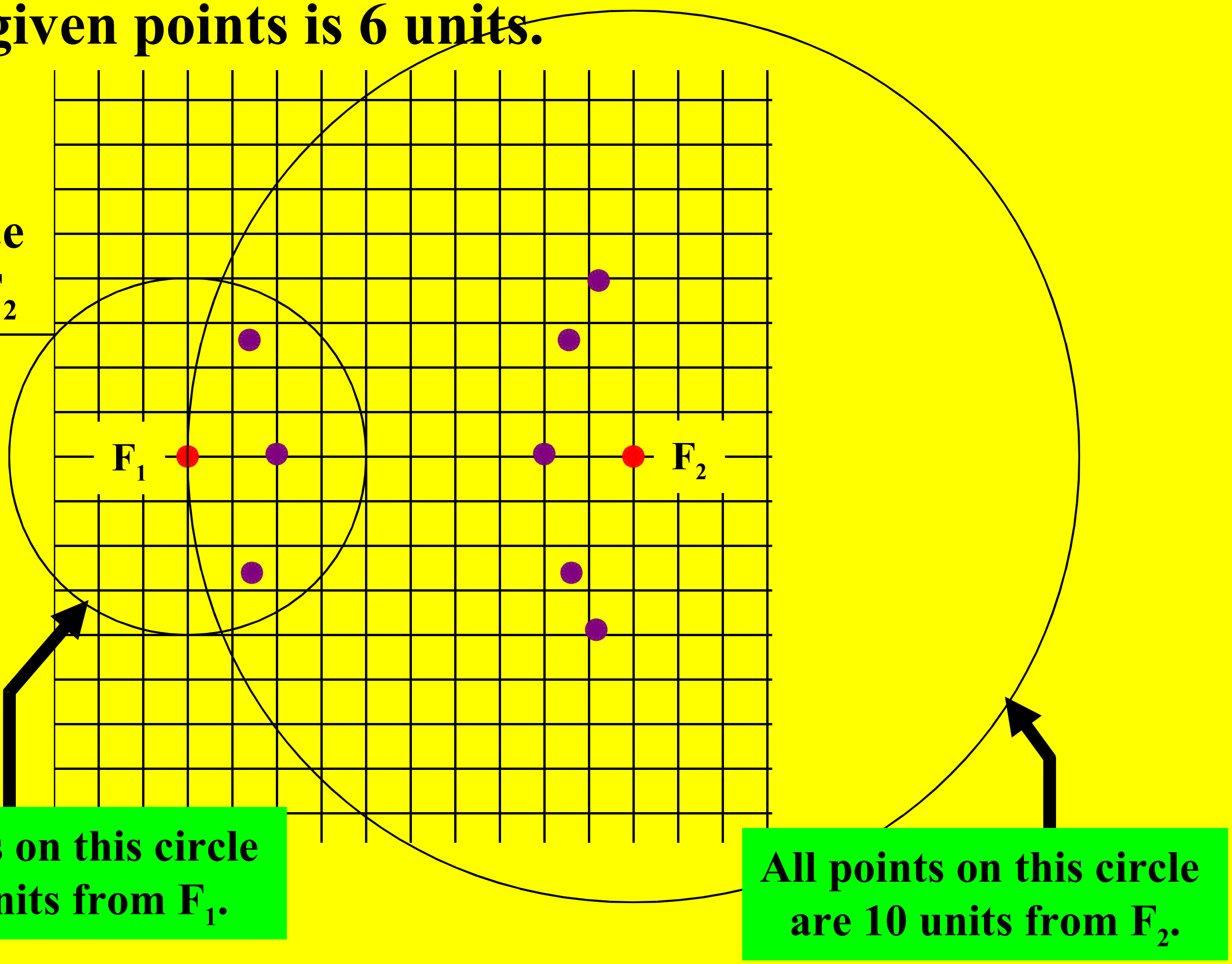
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10



All points on this circle are 4 units from F_1.

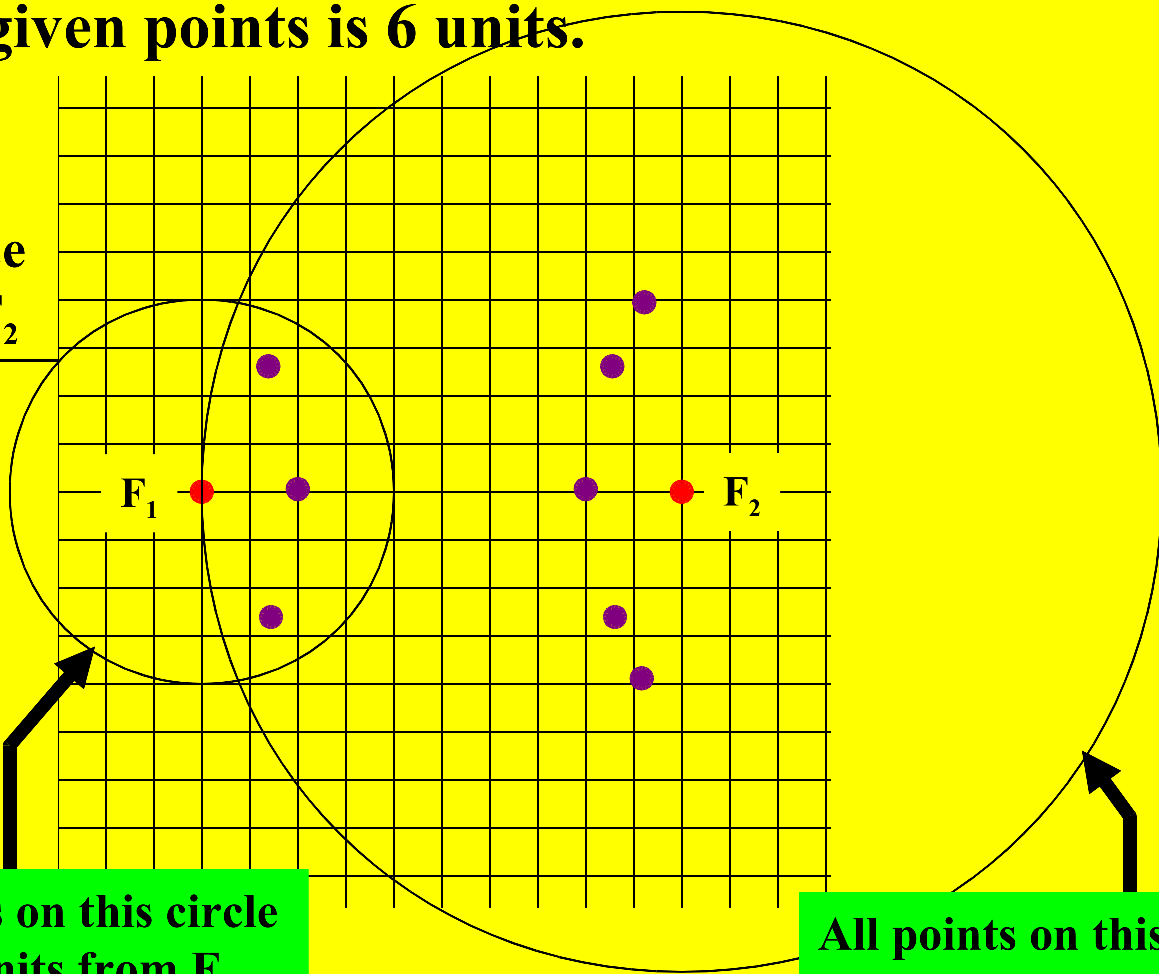
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10



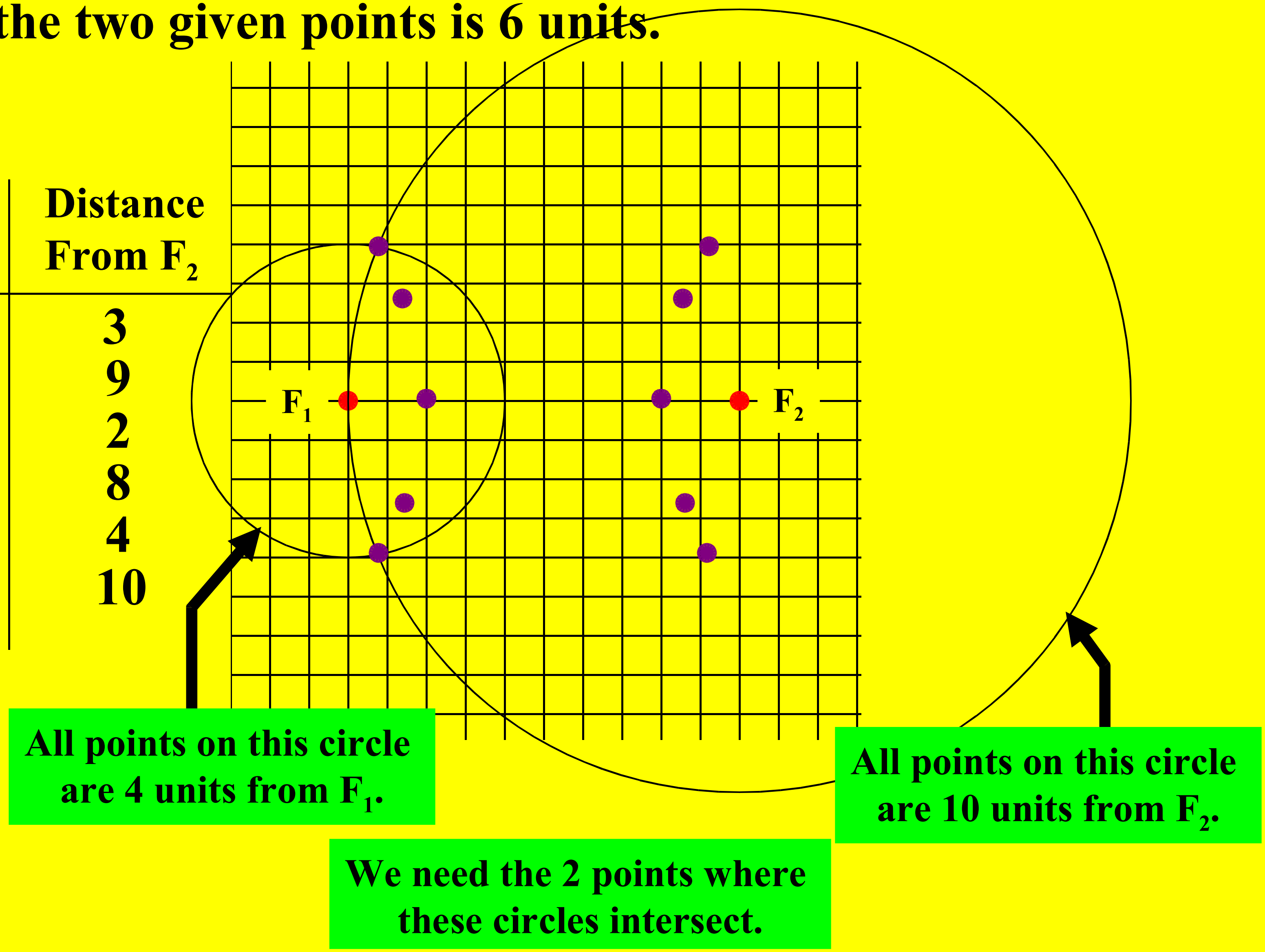
All points on this circle are 4 units from F_1.

All points on this circle are 10 units from F_2.

We need the 2 points where these circles intersect.

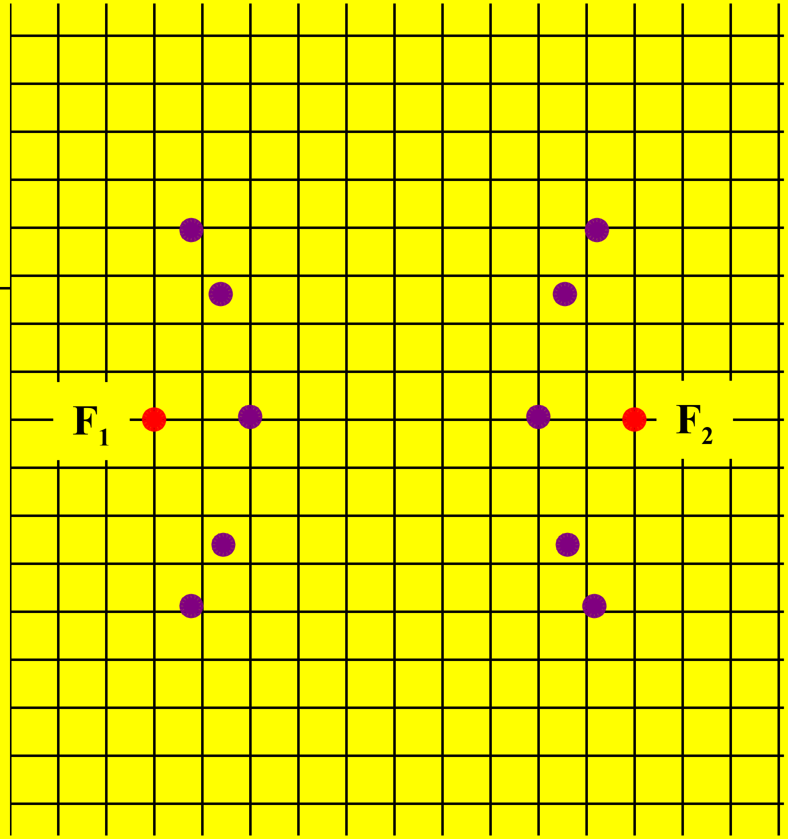
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10



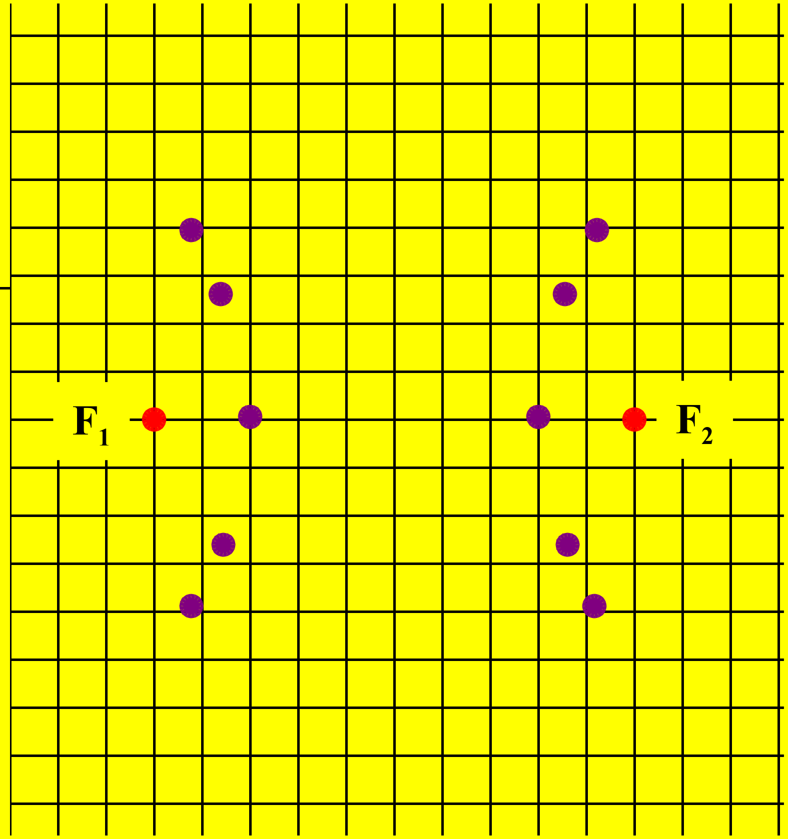
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10



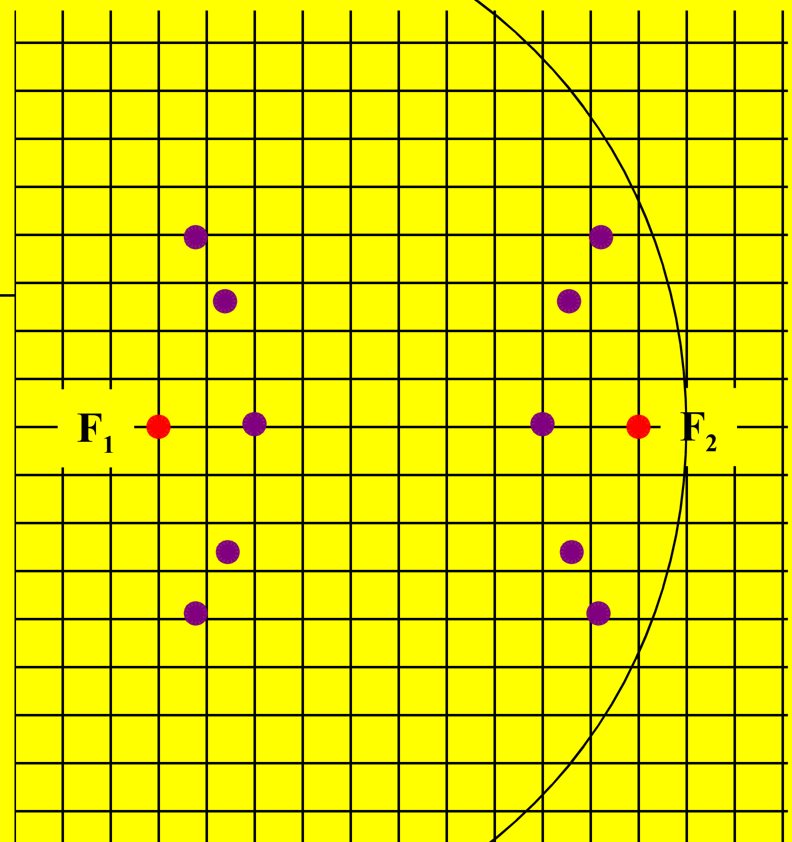
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

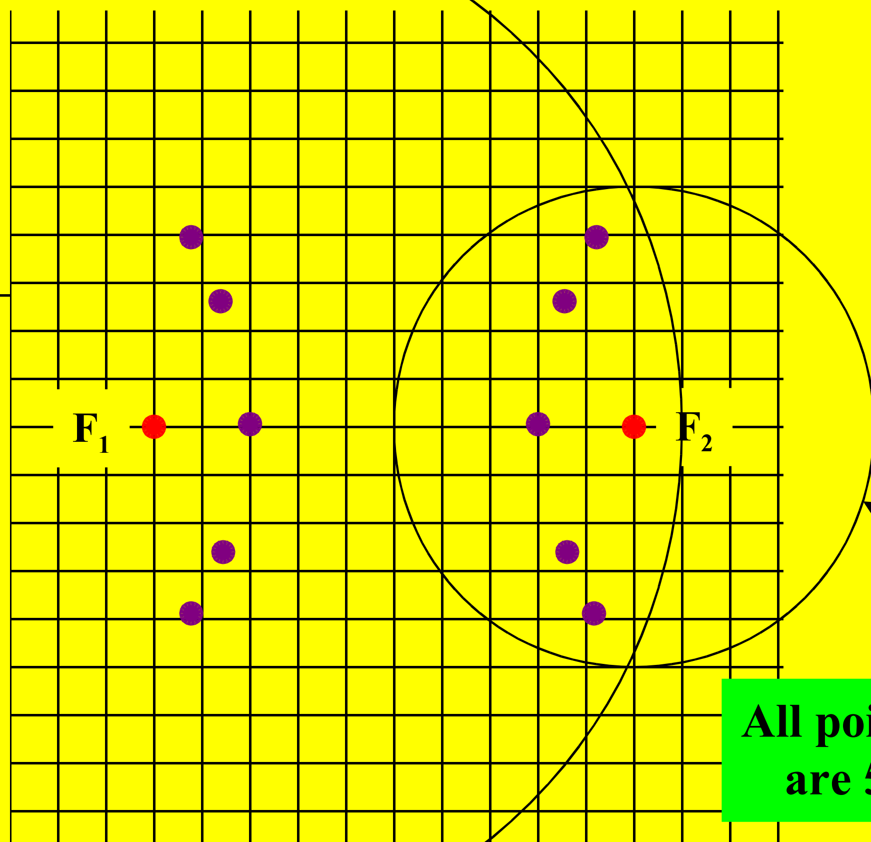
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5



All points on this circle are 11 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	**Distance From F_2**
9	3
3	9
8	2
2	8
10	4
4	10
11	5

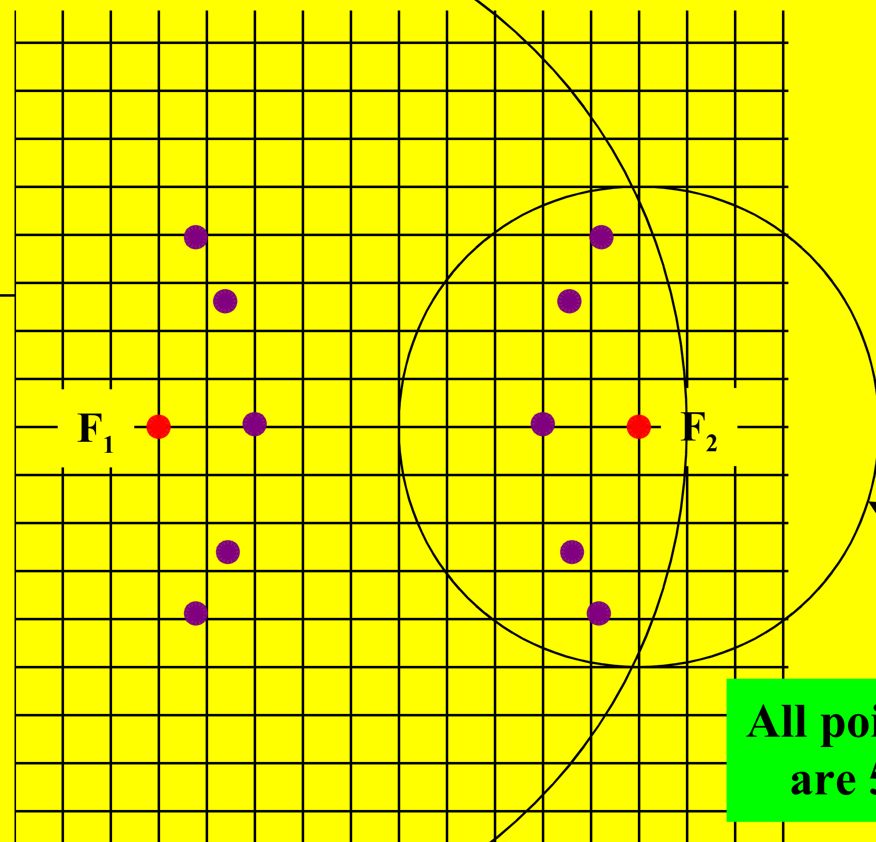


All points on this circle are 5 units from F_2.

All points on this circle are 11 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5



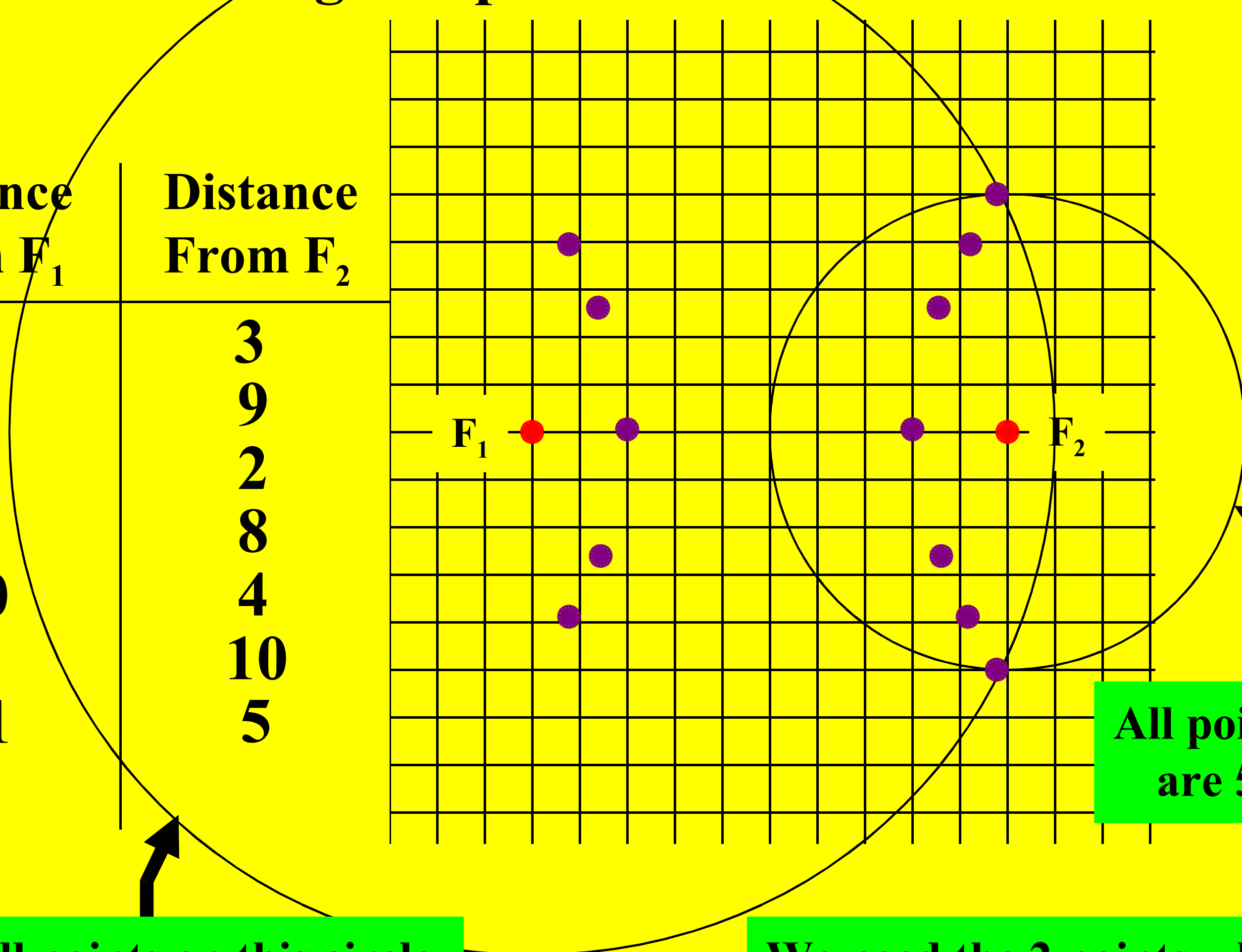
All points on this circle are 5 units from F_2.

All points on this circle are 11 units from F_1.

We need the 2 points where these circles intersect.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5



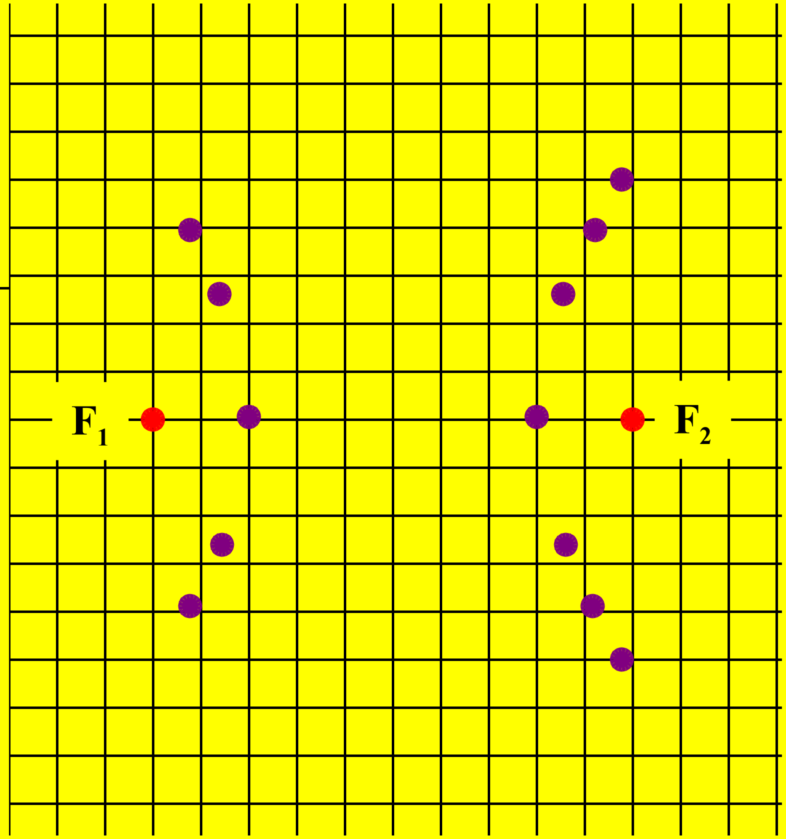
All points on this circle are 5 units from F_2.

All points on this circle are 11 units from F_1.

We need the 2 points where these circles intersect.

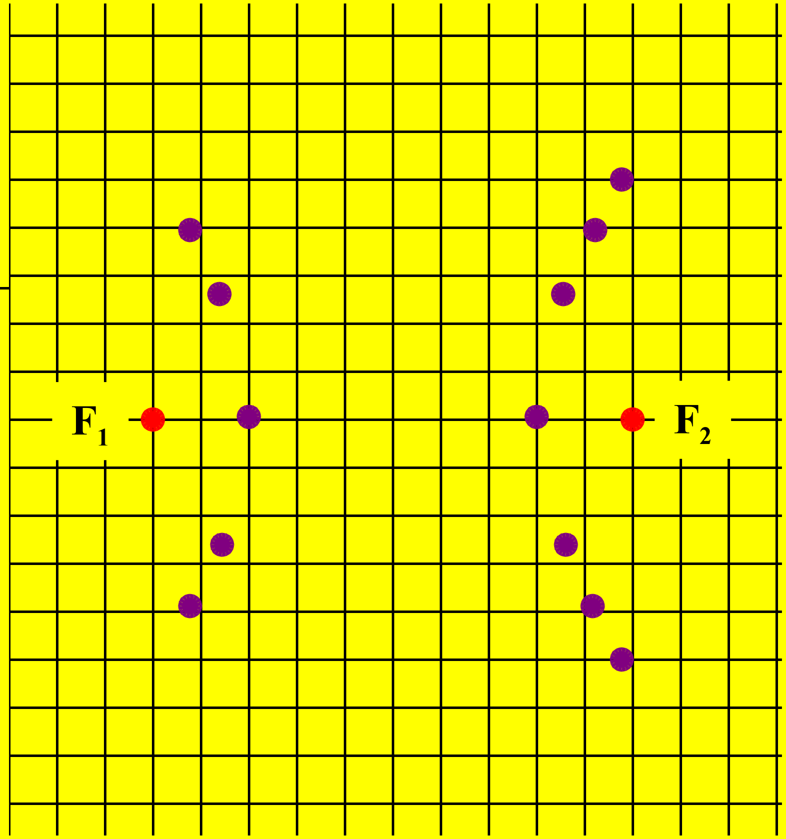
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5



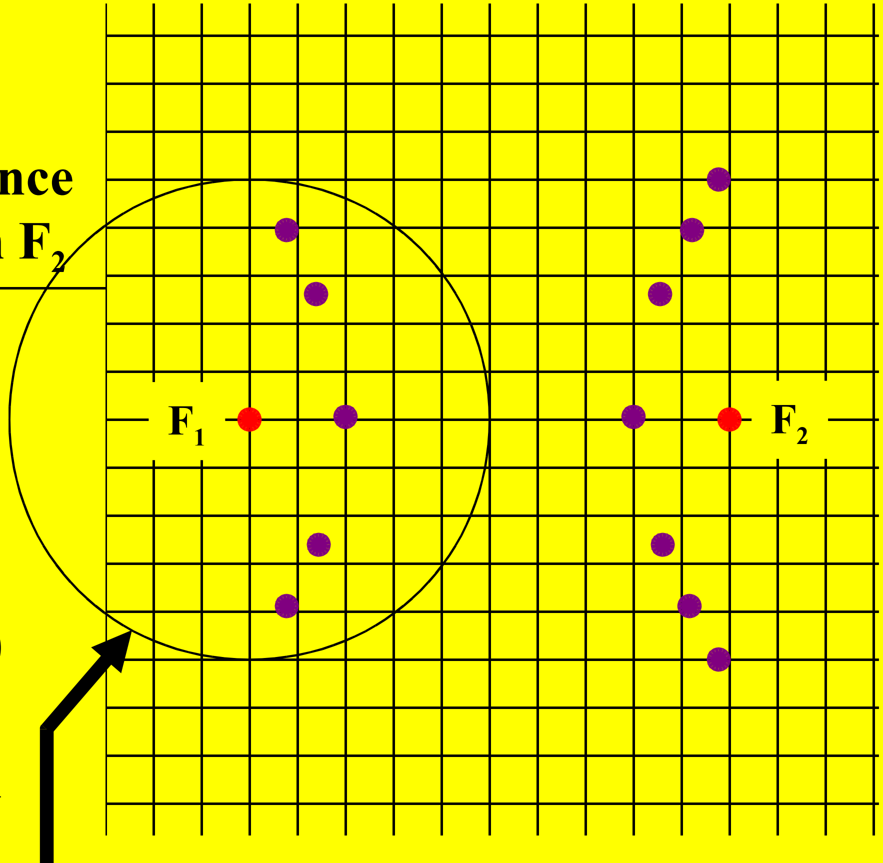
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

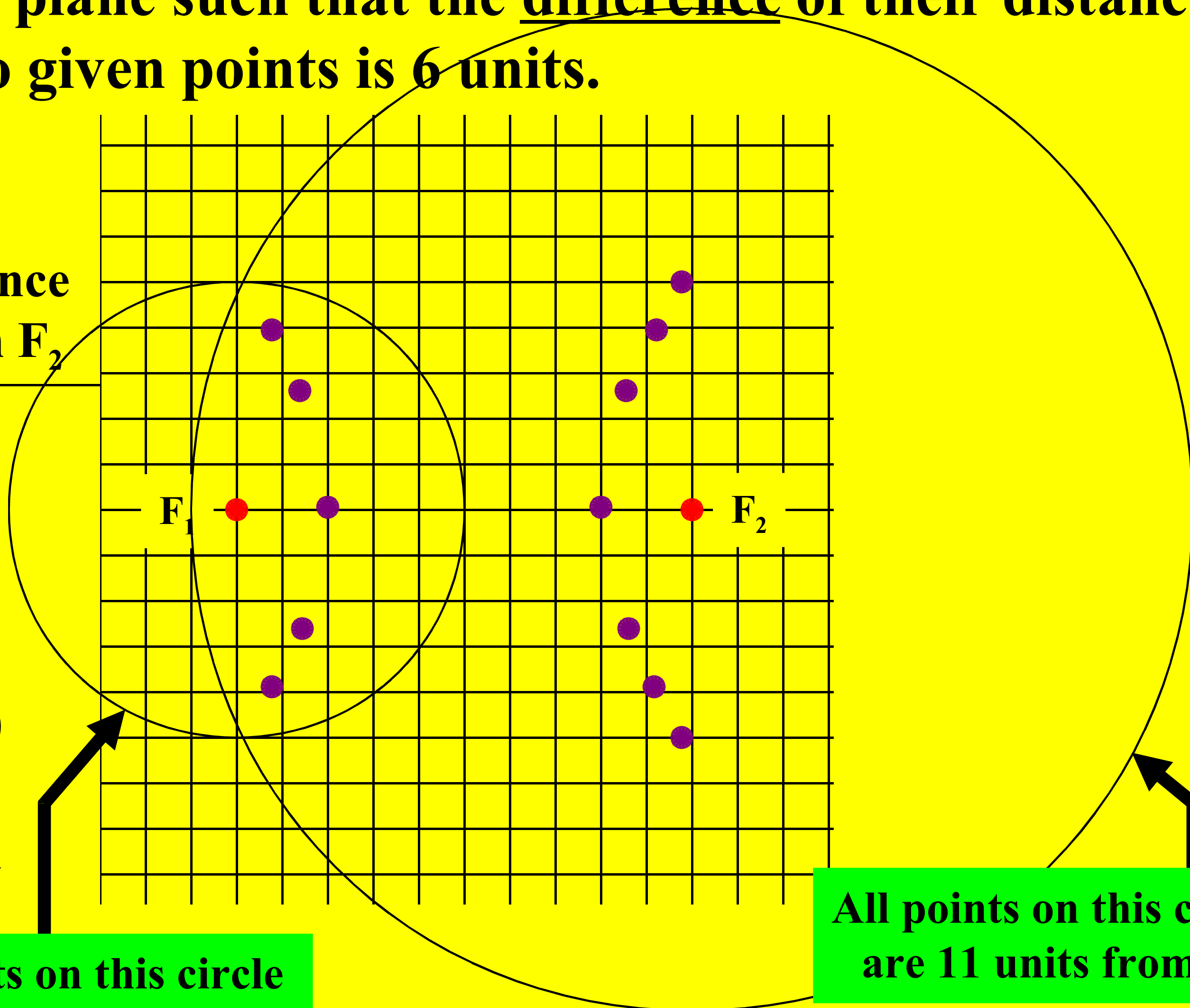
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11



All points on this circle are 5 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11

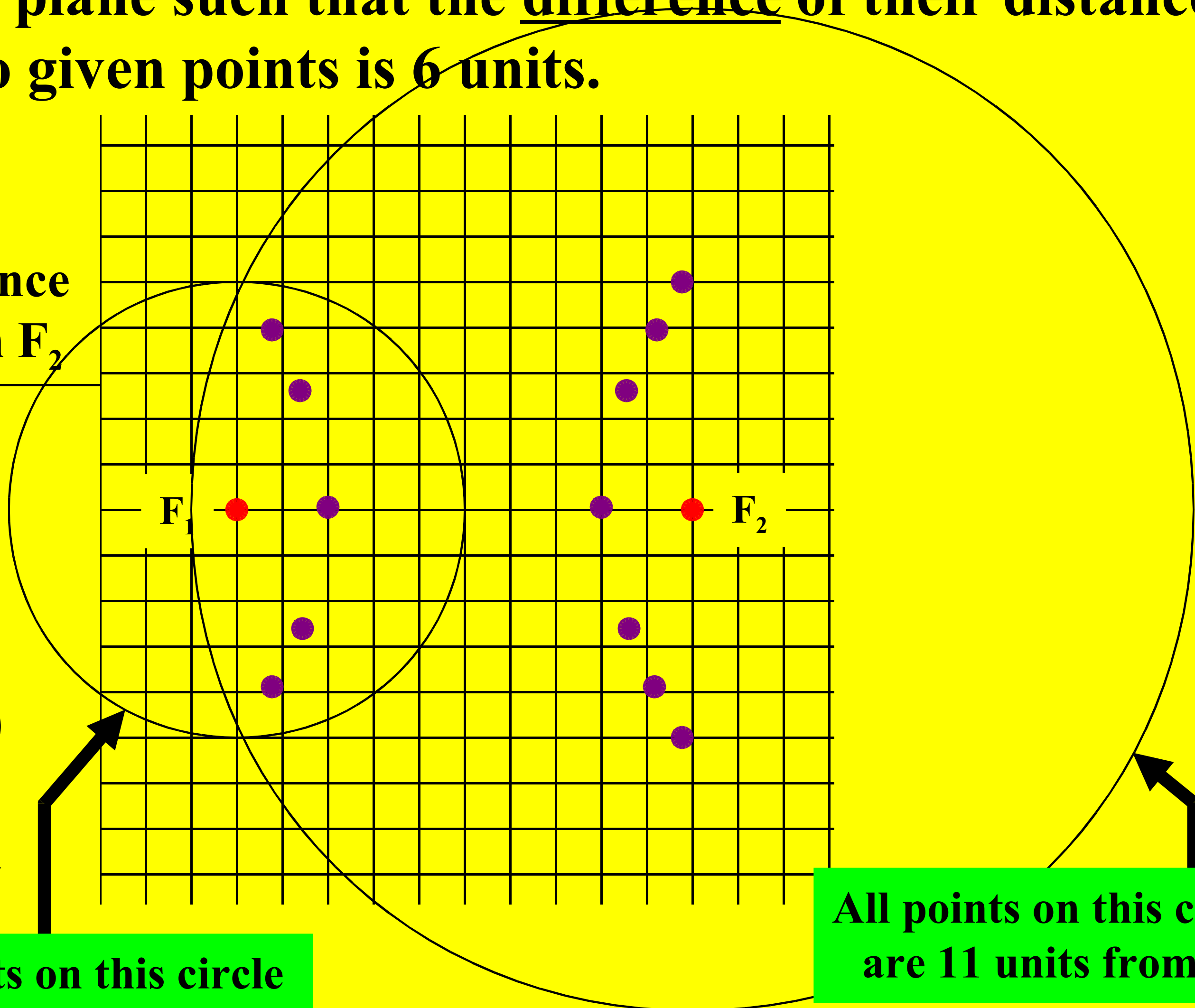


All points on this circle are 5 units from F_1.

All points on this circle are 11 units from F_2.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11



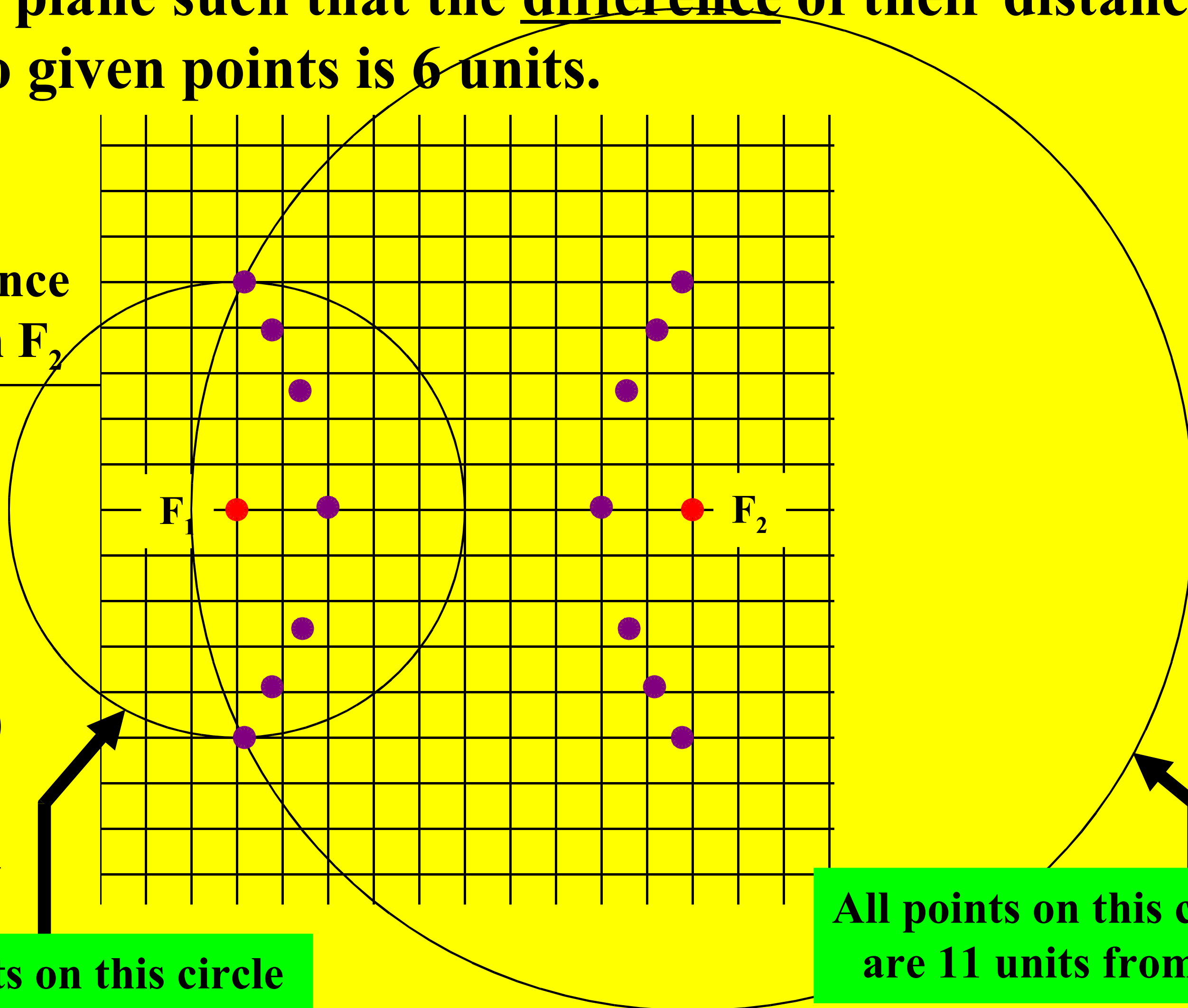
All points on this circle are 5 units from F_1.

We need the 2 points where these circles intersect.

All points on this circle are 11 units from F_2.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11



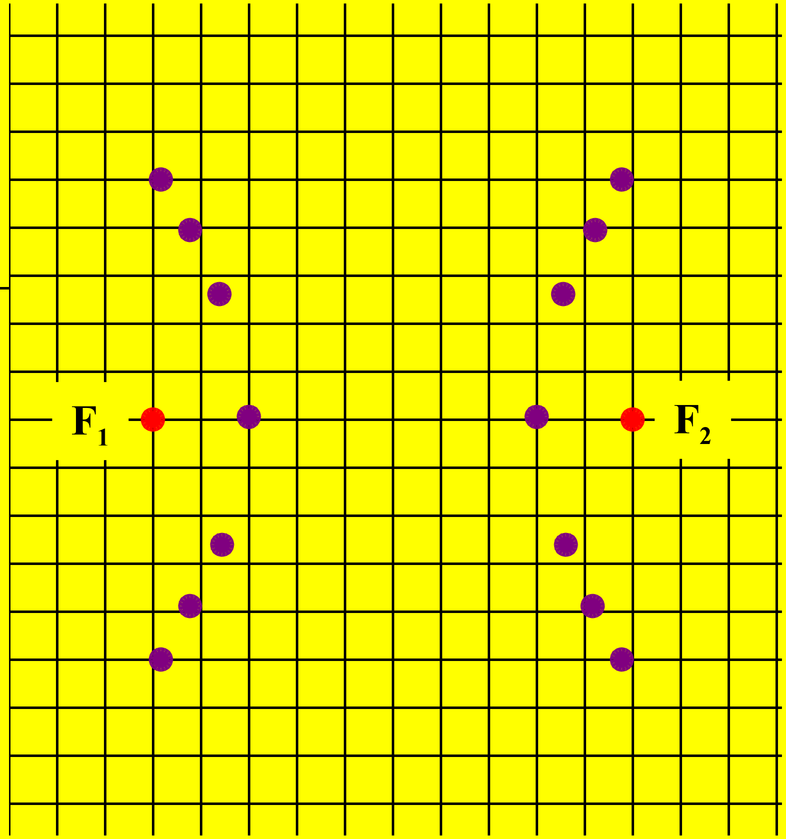
All points on this circle are 5 units from F_1.

All points on this circle are 11 units from F_2.

We need the 2 points where these circles intersect.

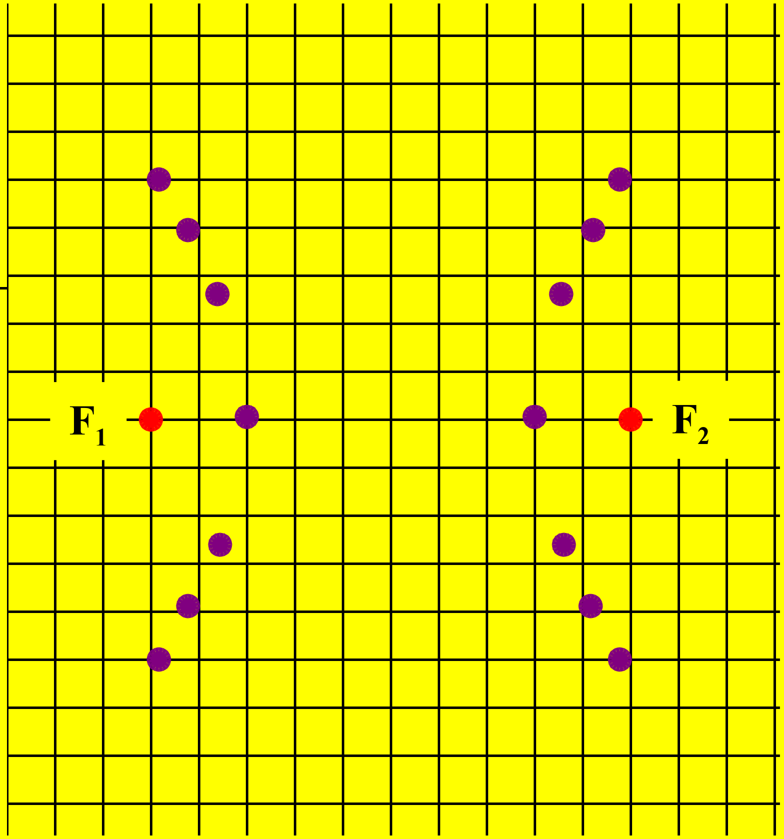
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11



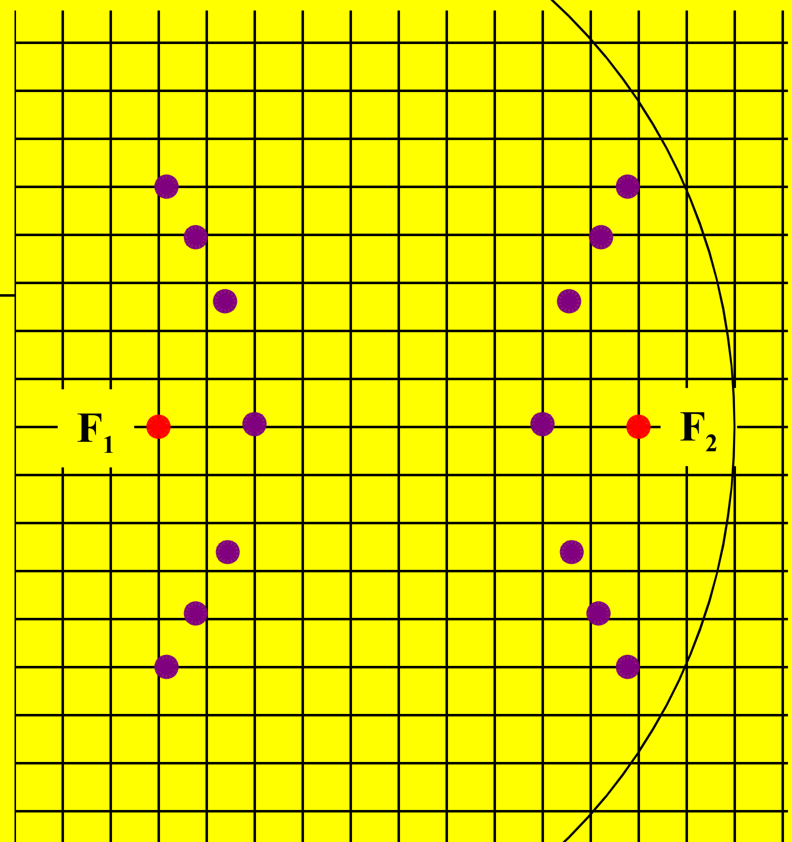
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

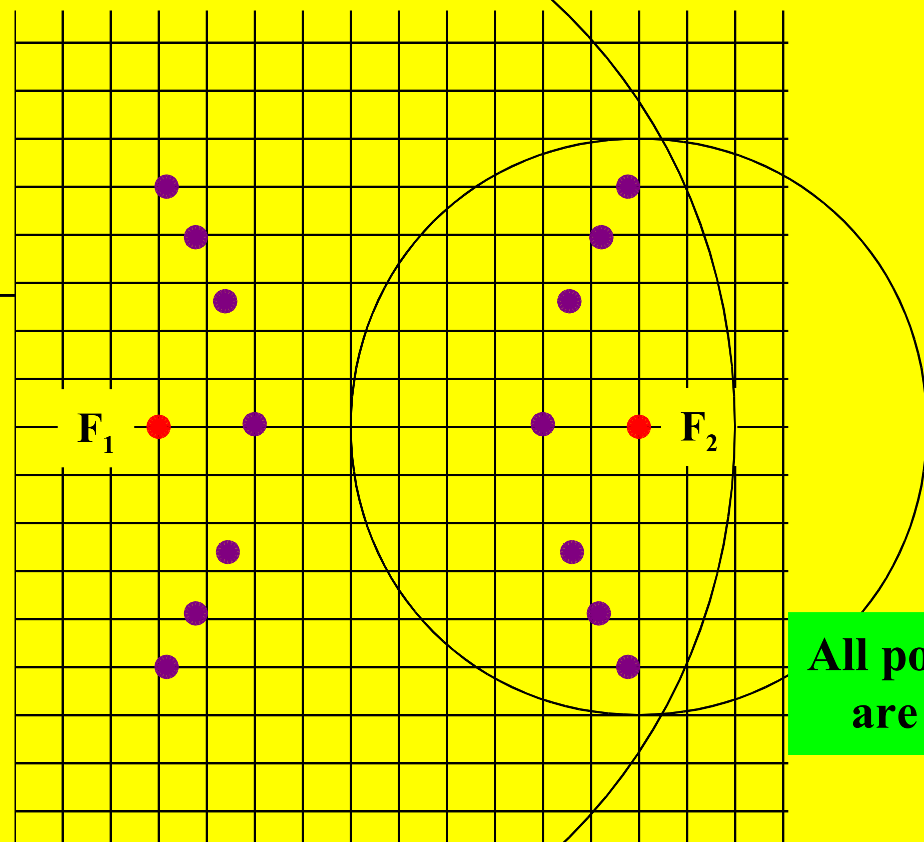
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6



All points on this circle are 12 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6

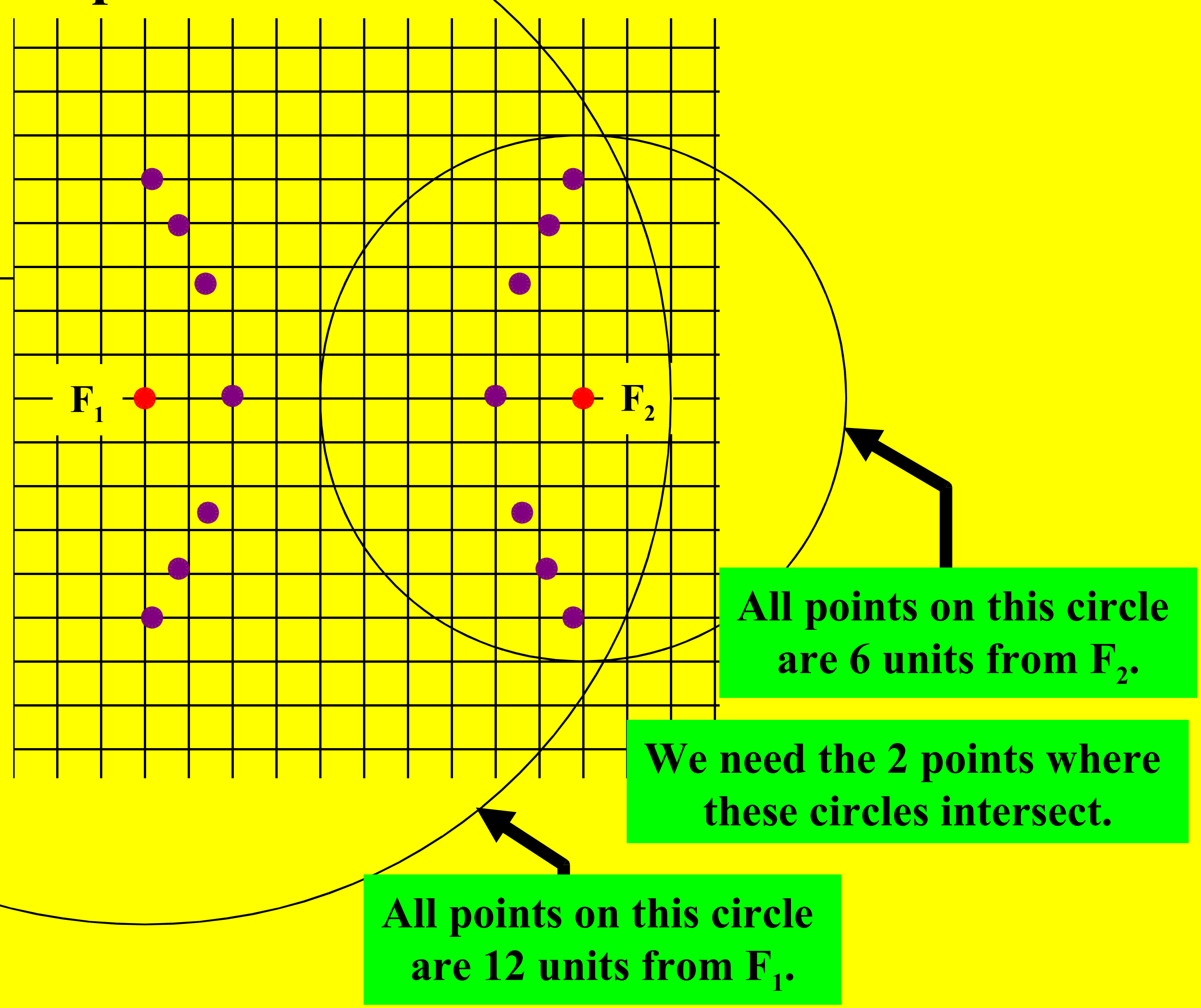


All points on this circle are 6 units from F_2.

All points on this circle are 12 units from F_1.

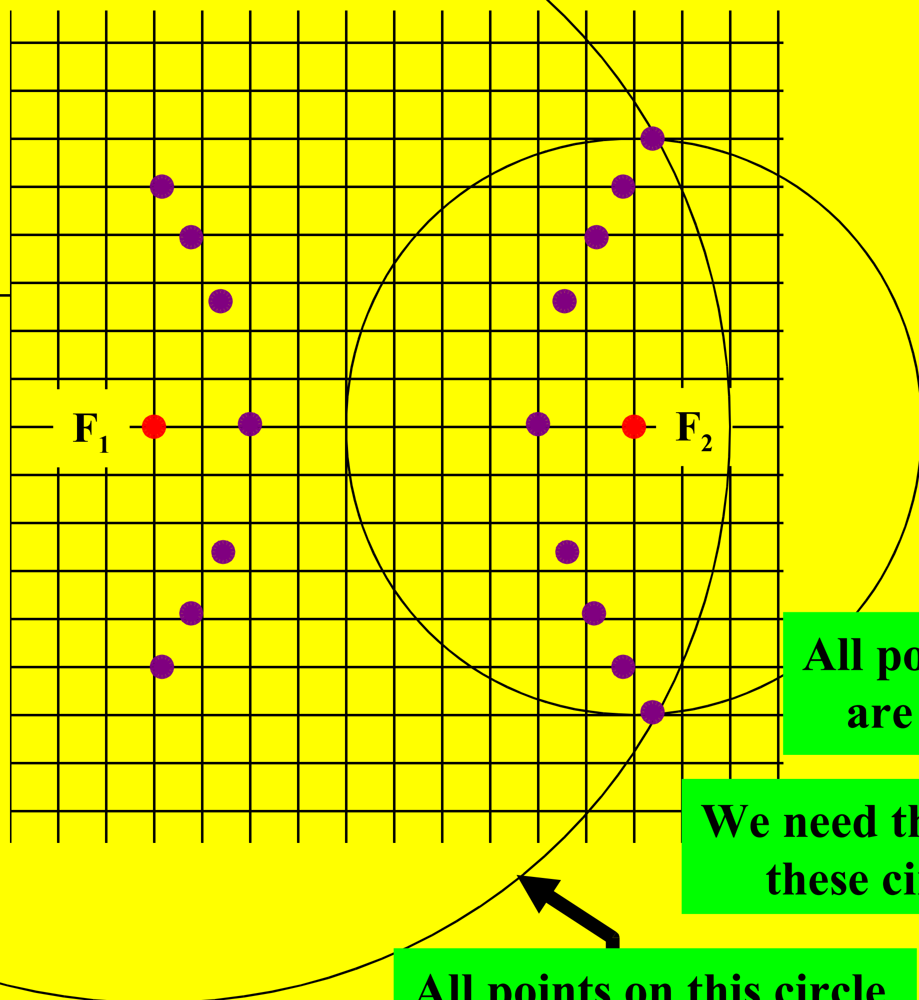
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	**Distance From F_2**
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6



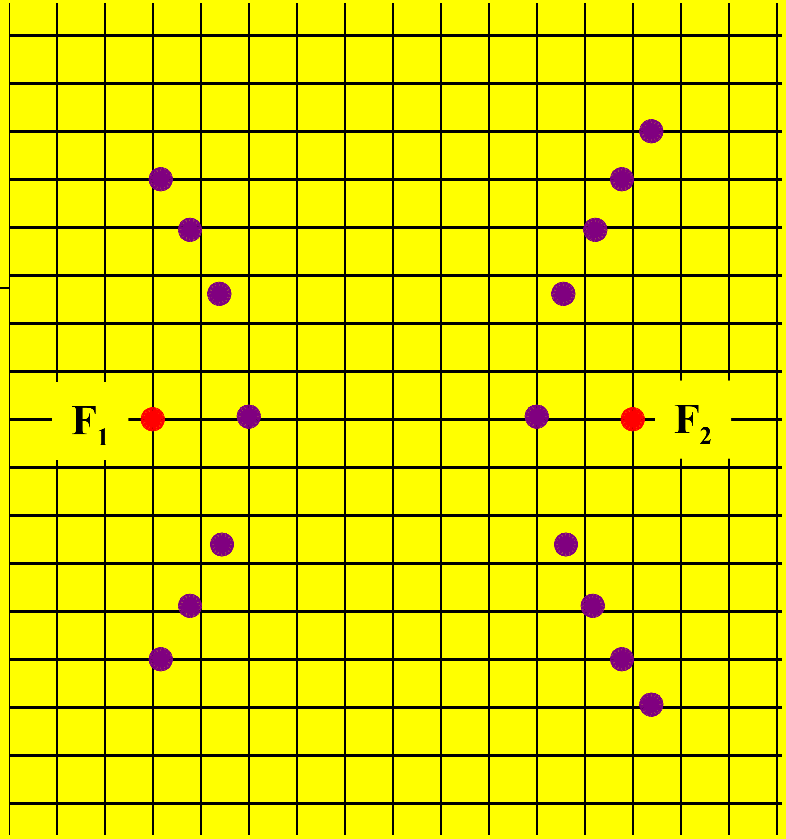
All points on this circle are 6 units from F_2.

We need the 2 points where these circles intersect.

All points on this circle are 12 units from F_1.

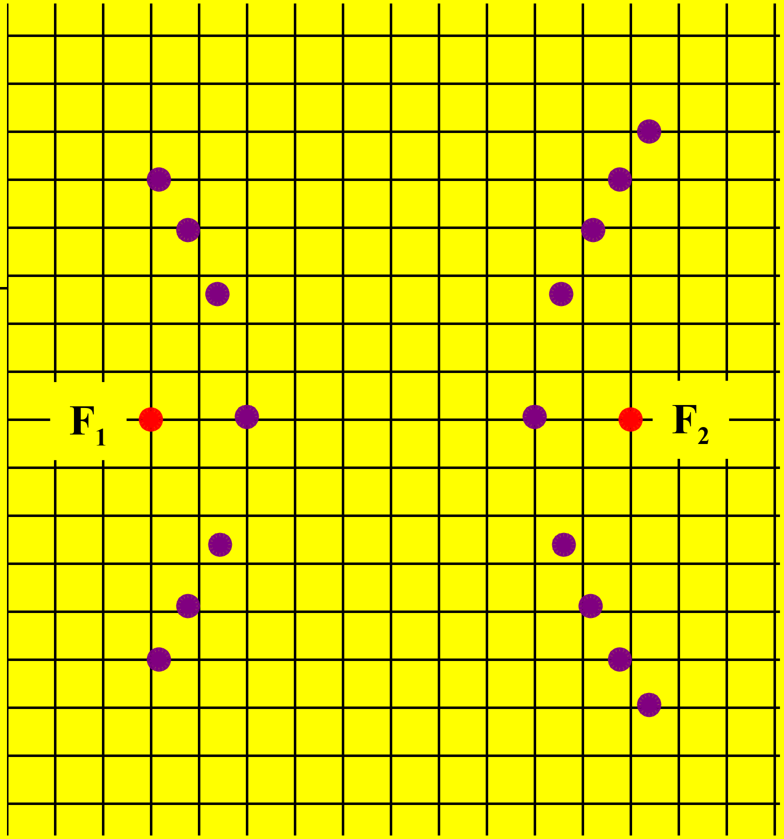
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6



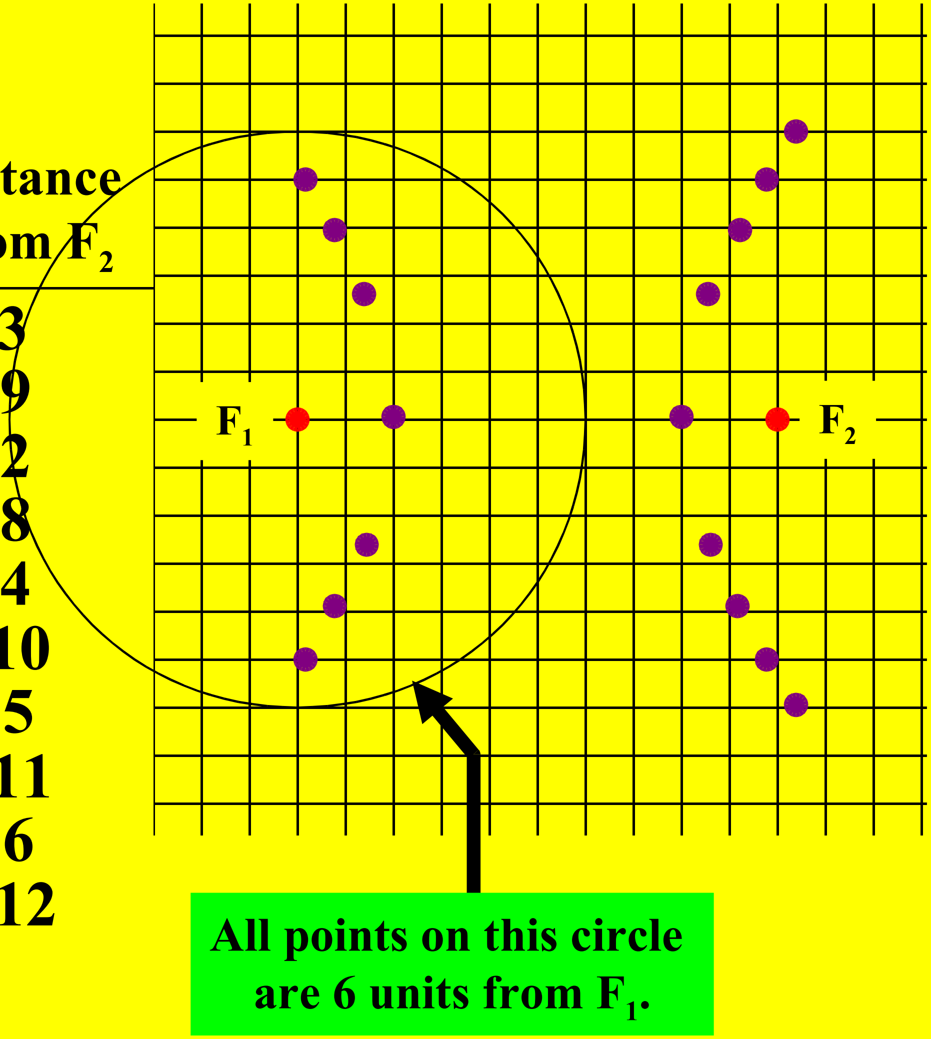
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12



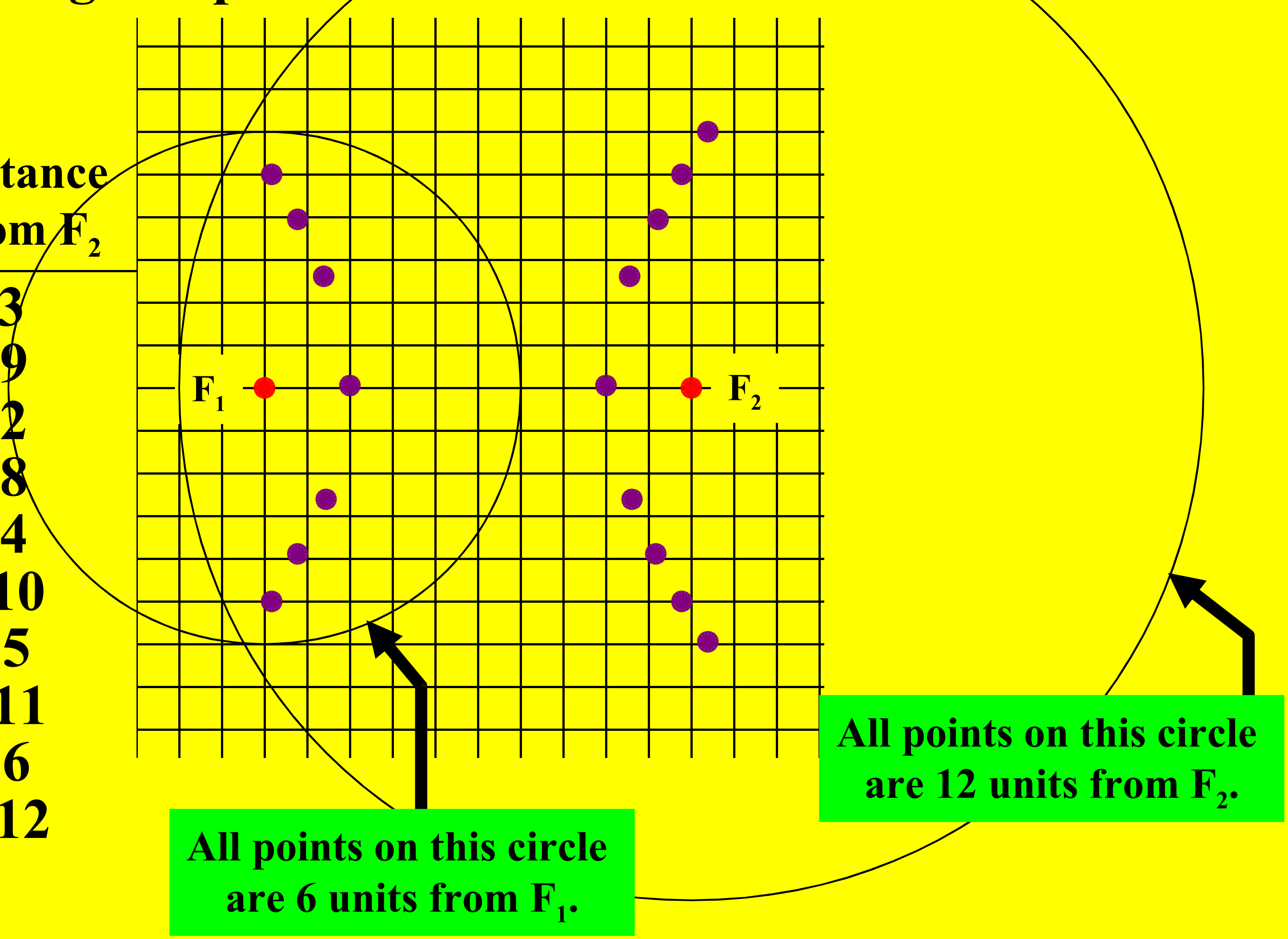
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12



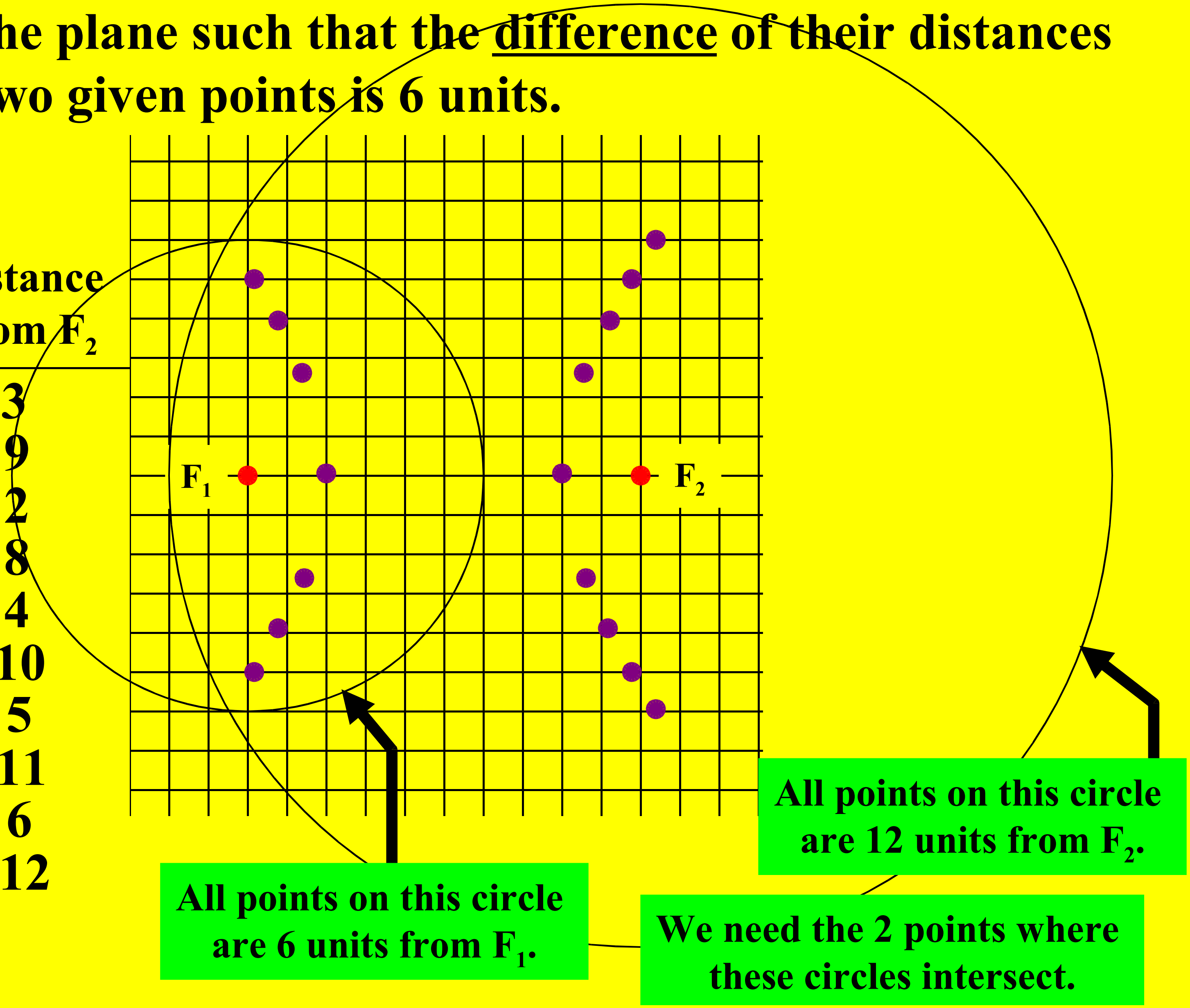
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12



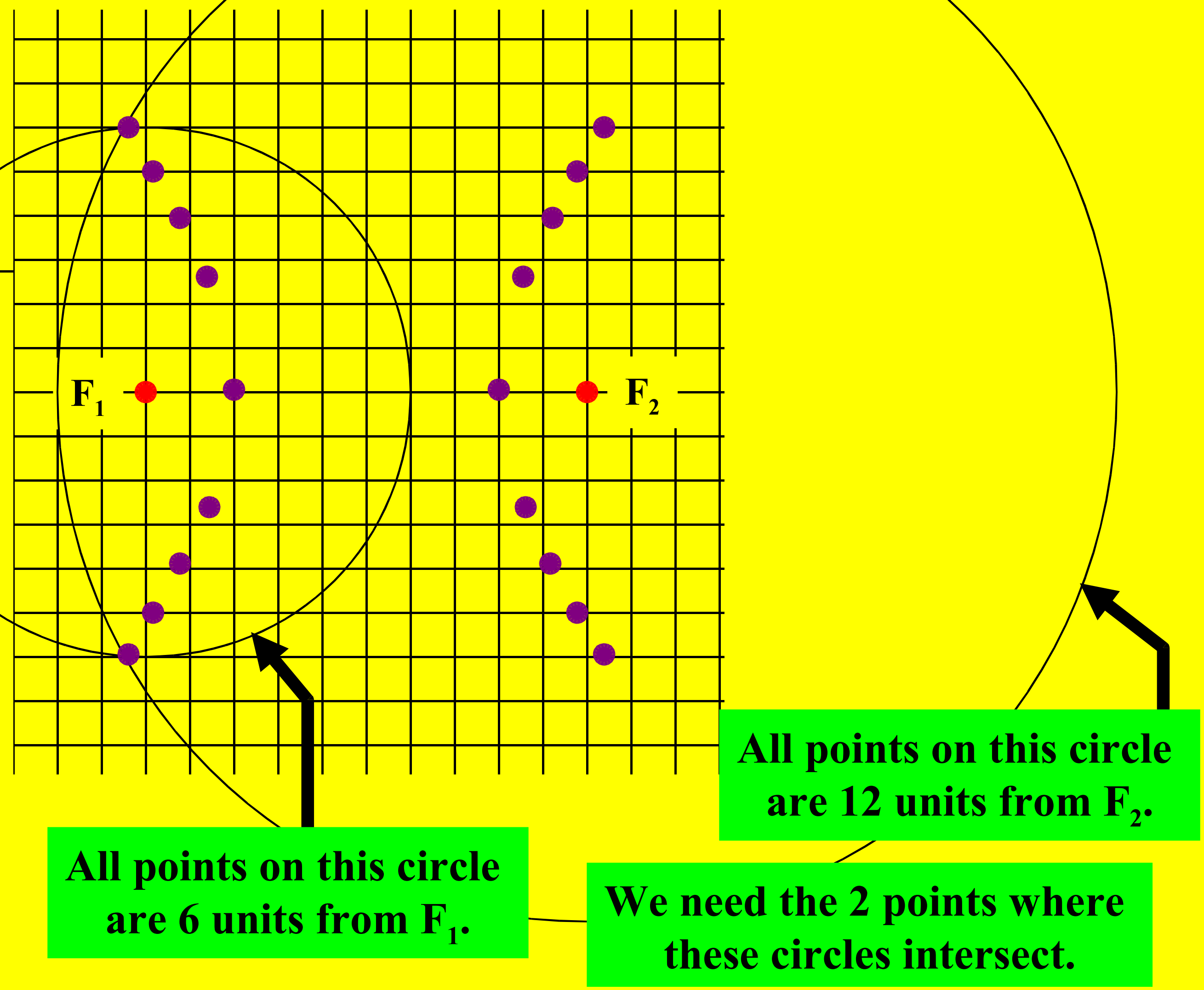
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12



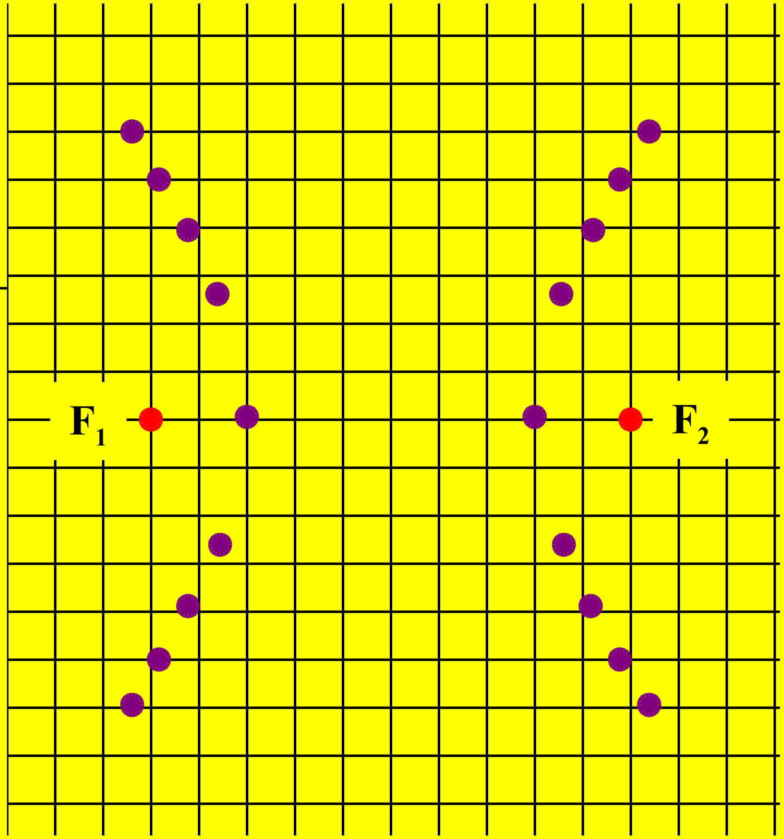
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12



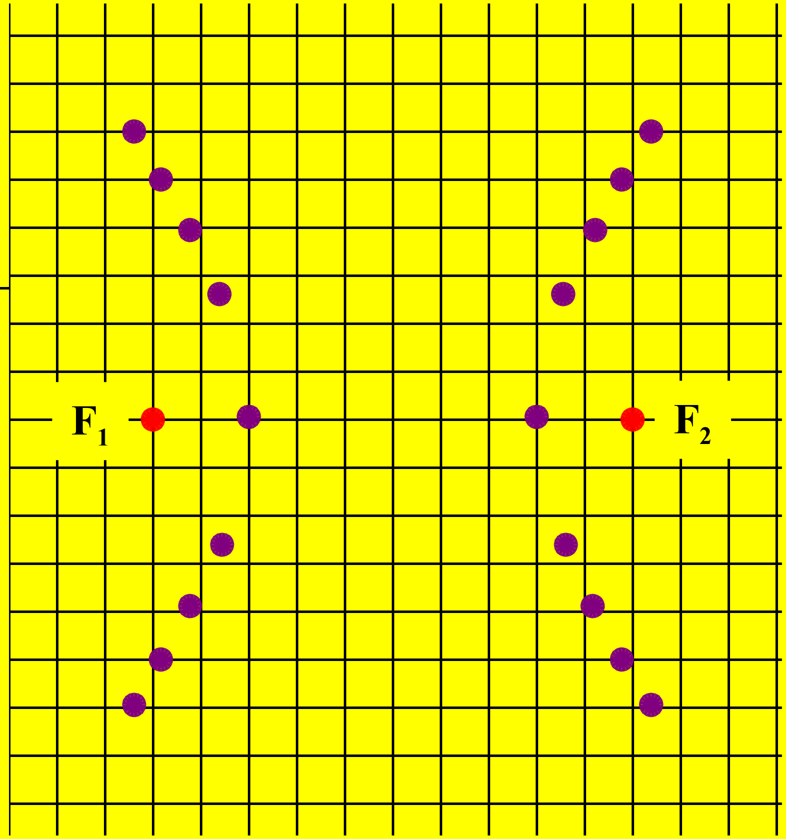
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12



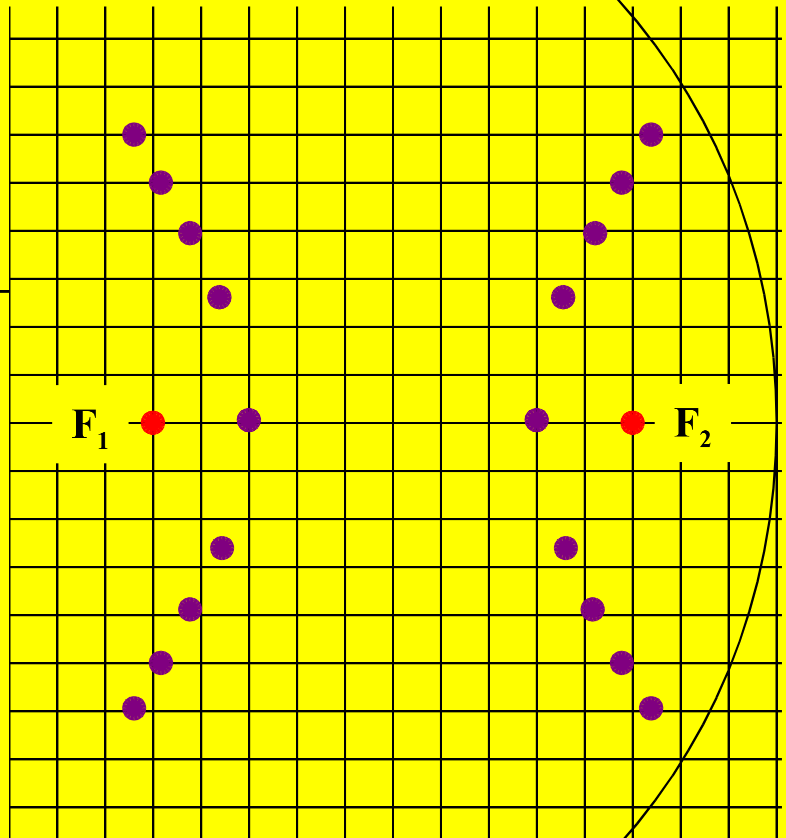
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

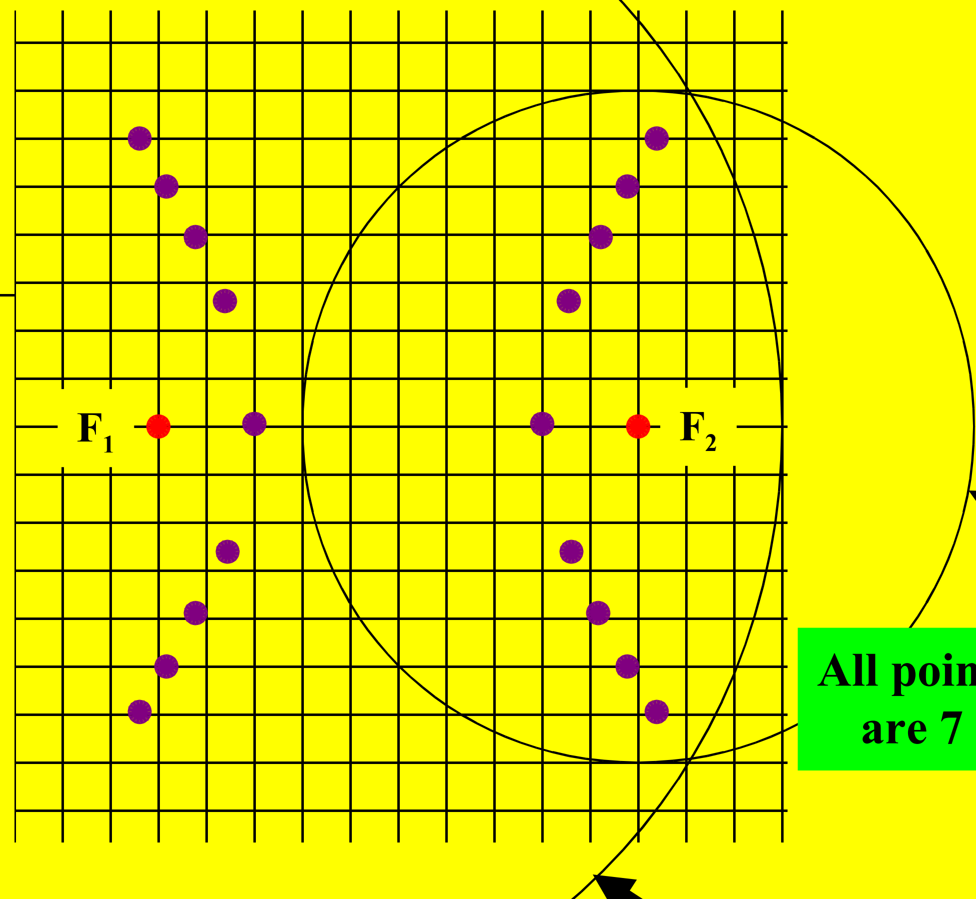
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7



All points on this circle are 12 units from F_1.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7

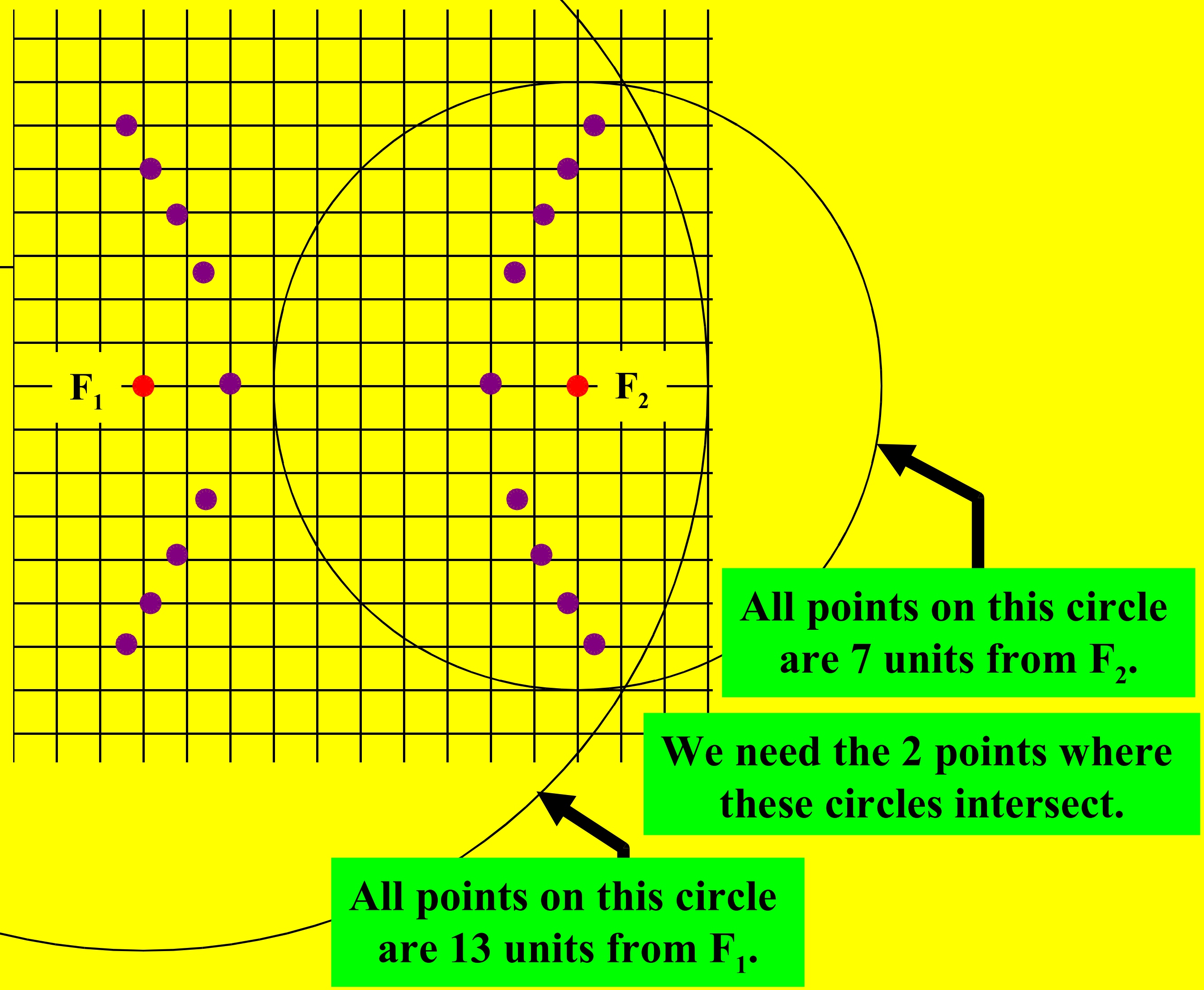


All points on this circle are 7 units from F_2.

All points on this circle are 13 units from F_1.

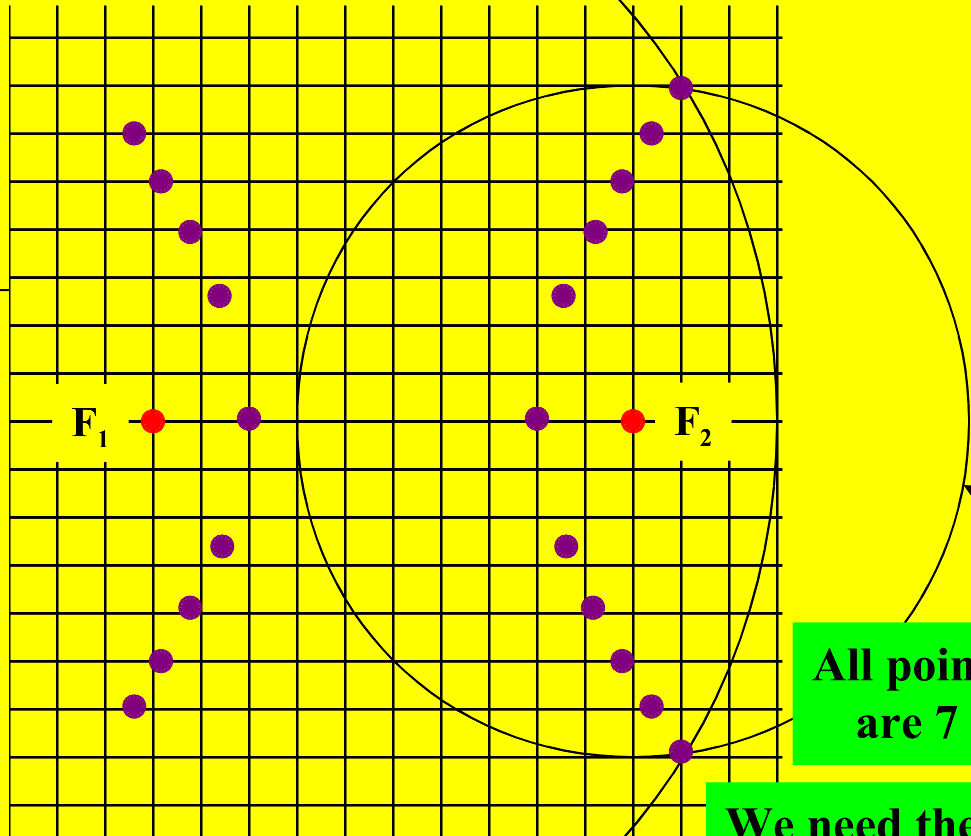
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7



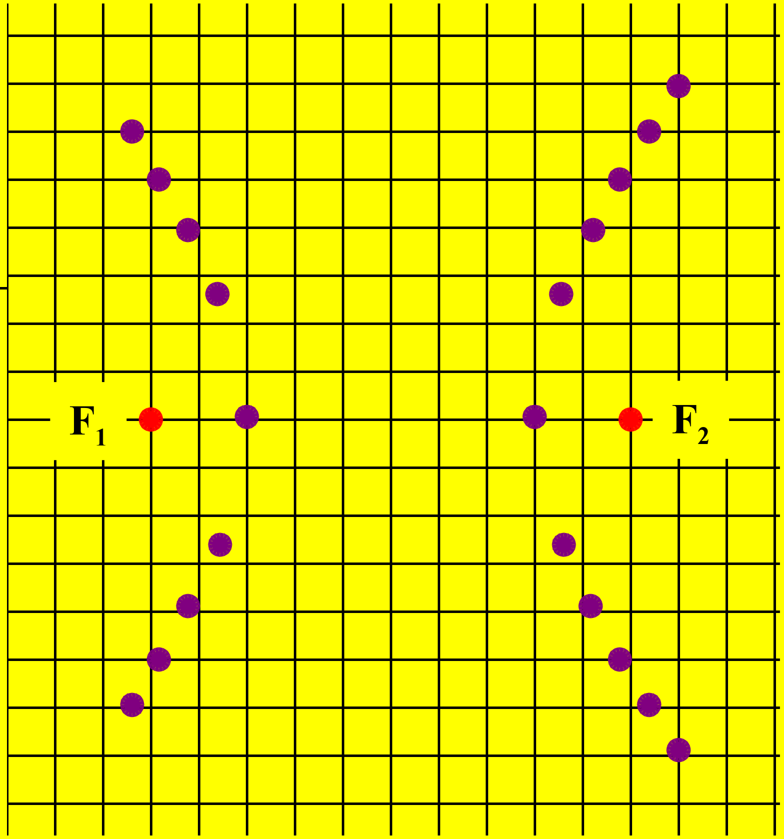
All points on this circle are 7 units from F_2.

We need the 2 points where these circles intersect.

All points on this circle are 13 units from F_1.

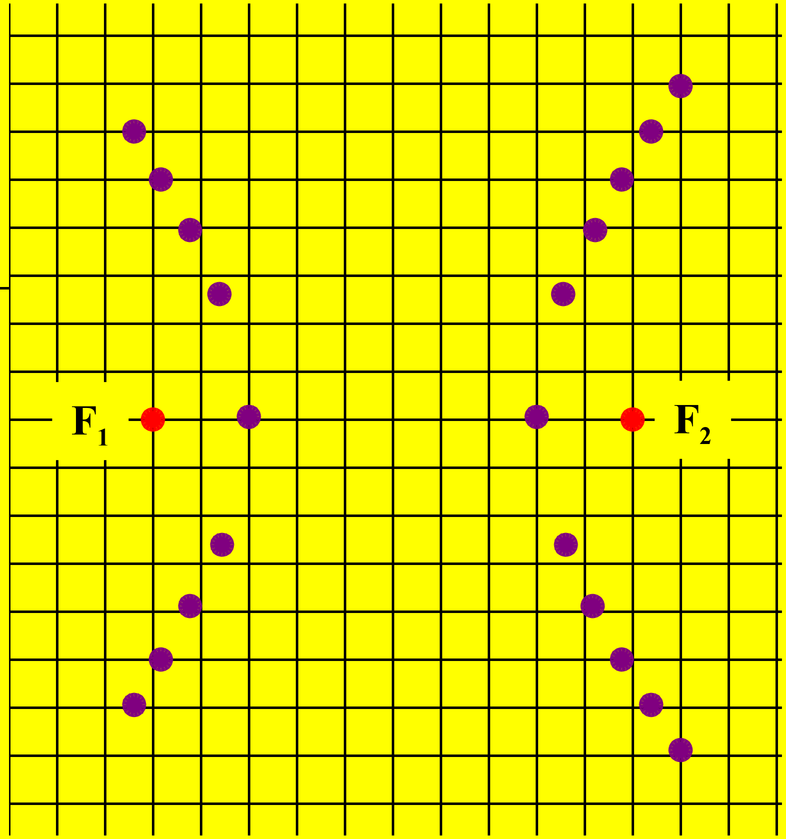
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7



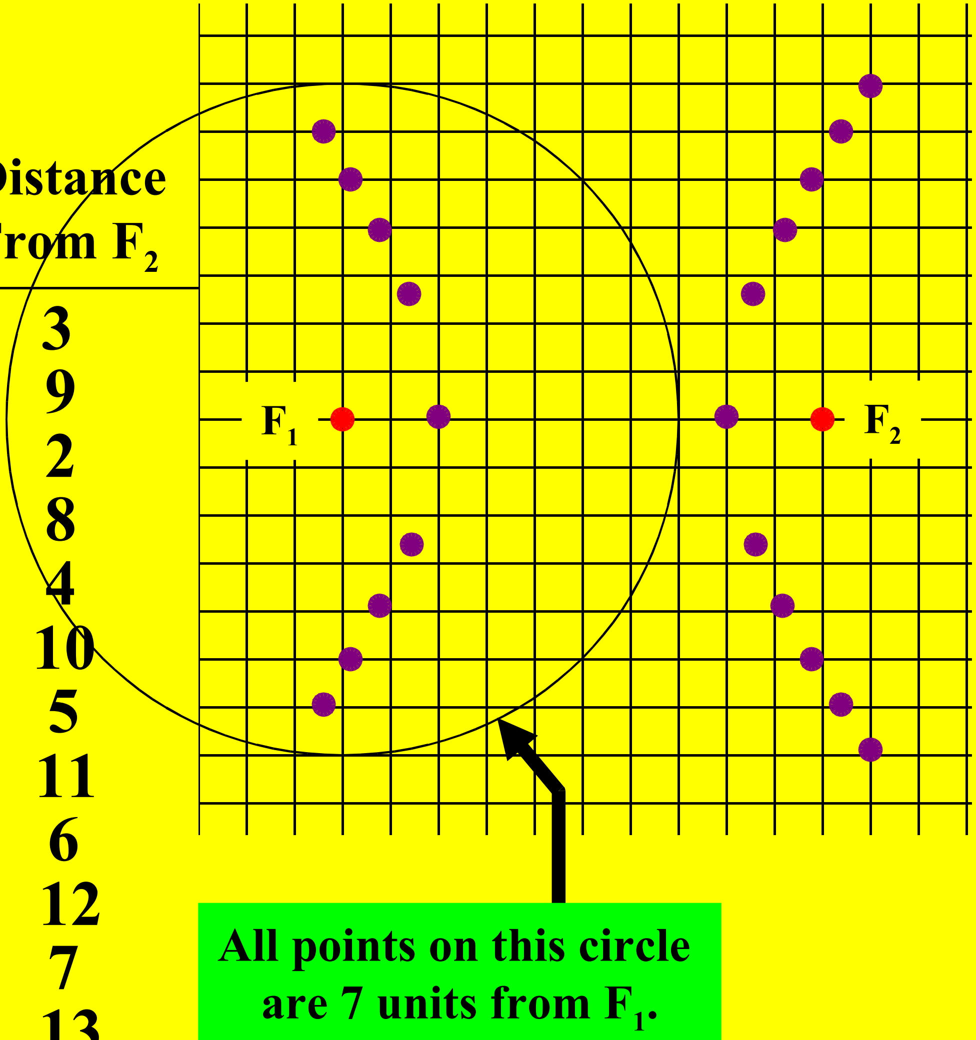
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7
7	13



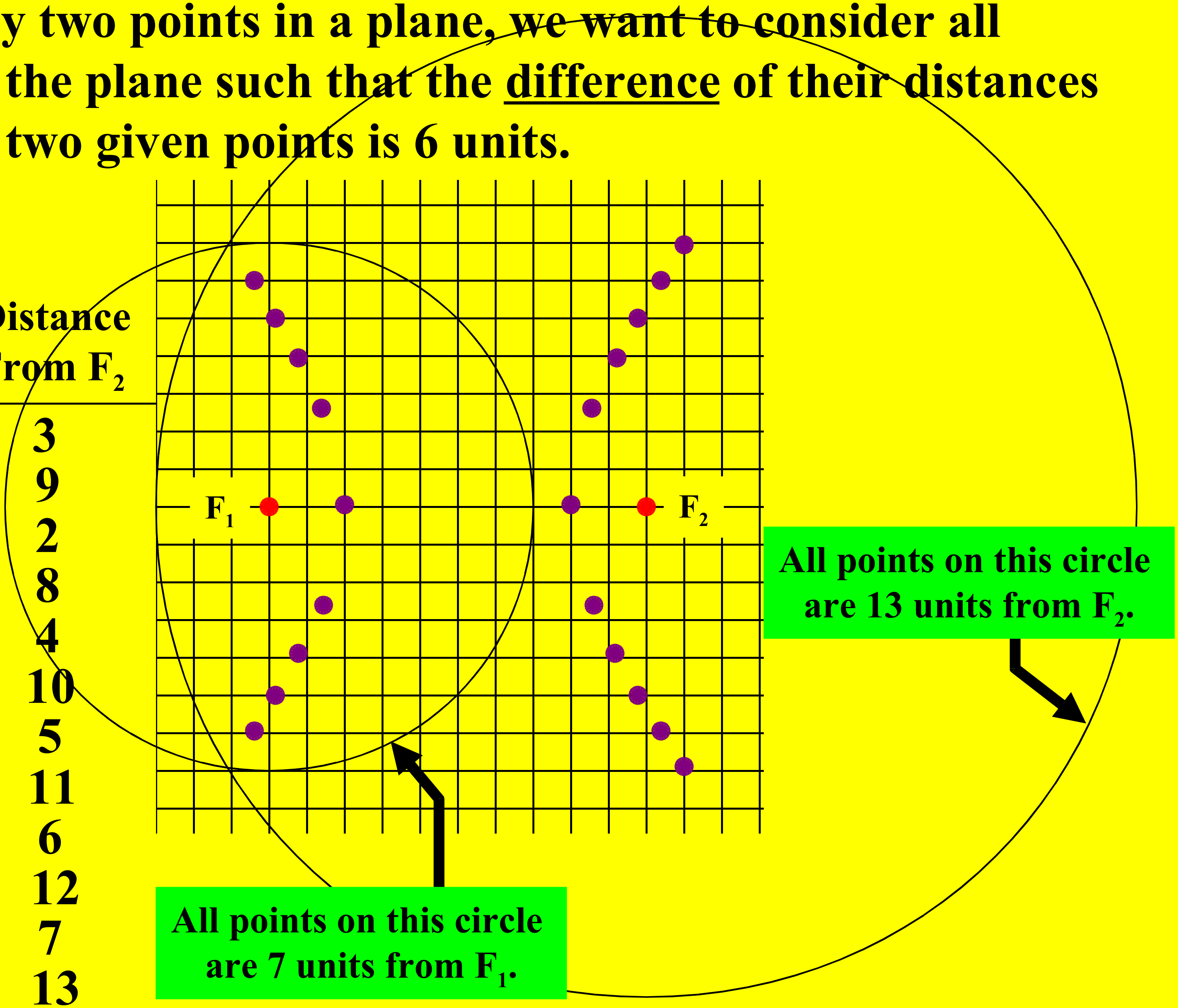
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7
7	13



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7
7	13



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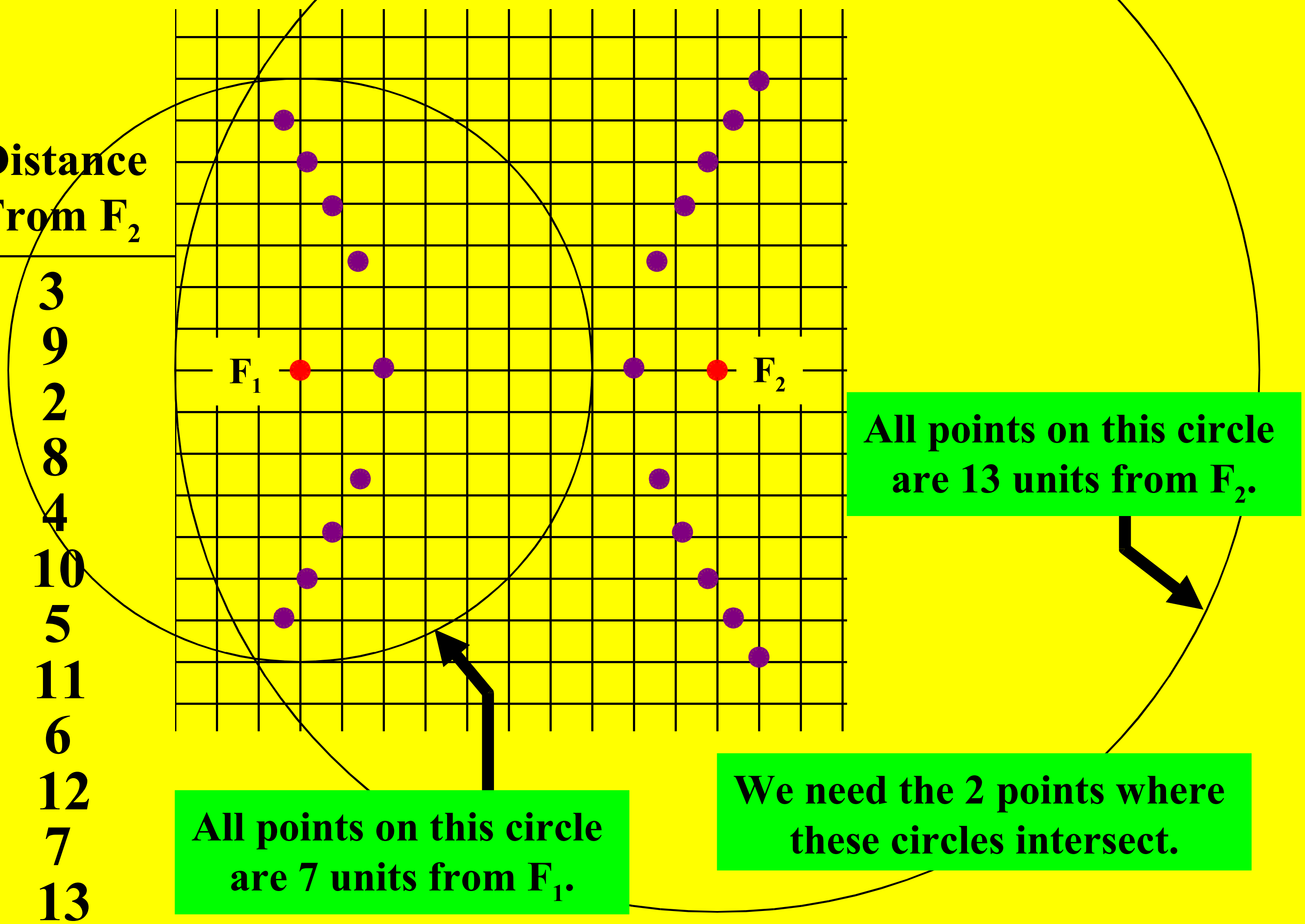
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7
7	13



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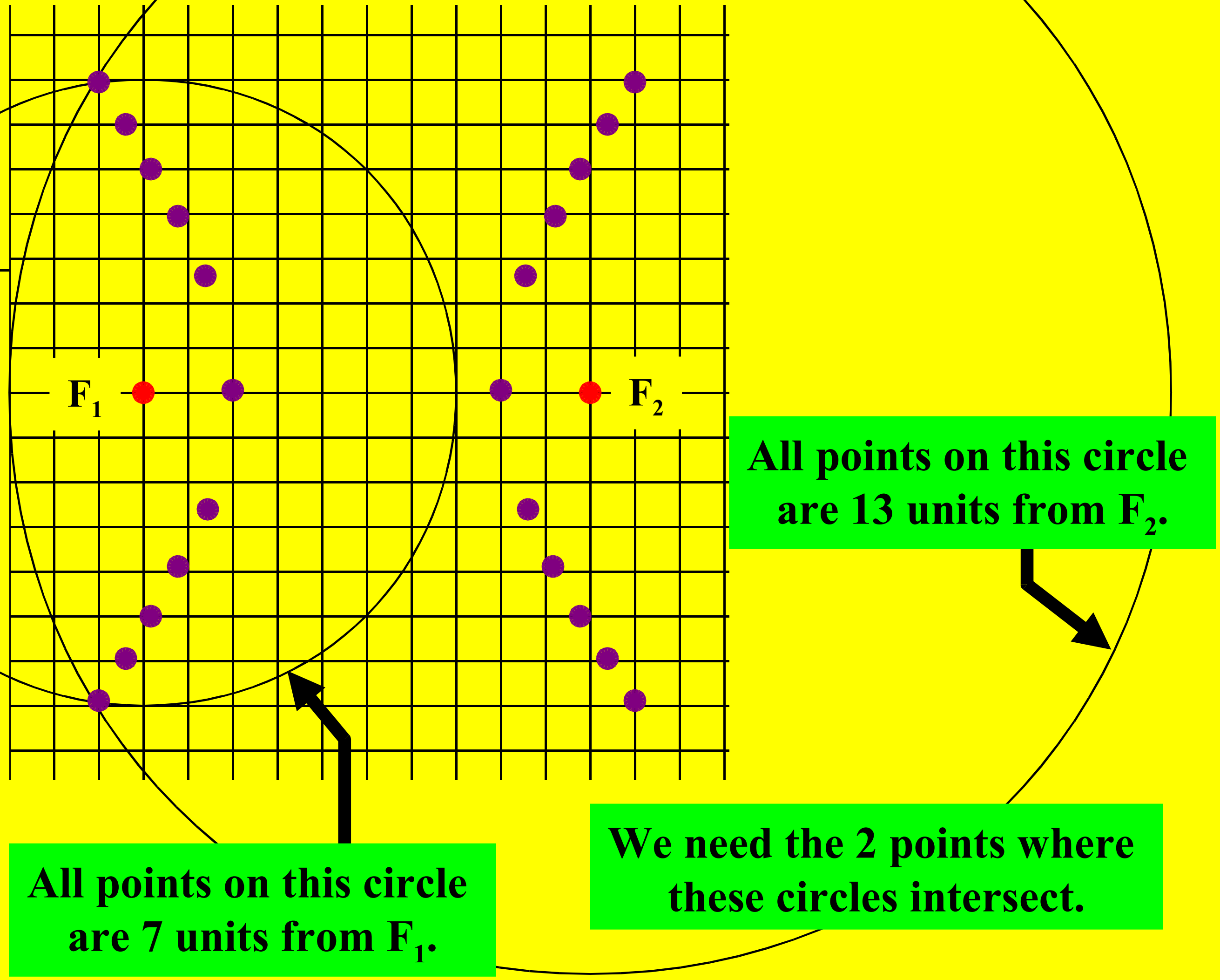
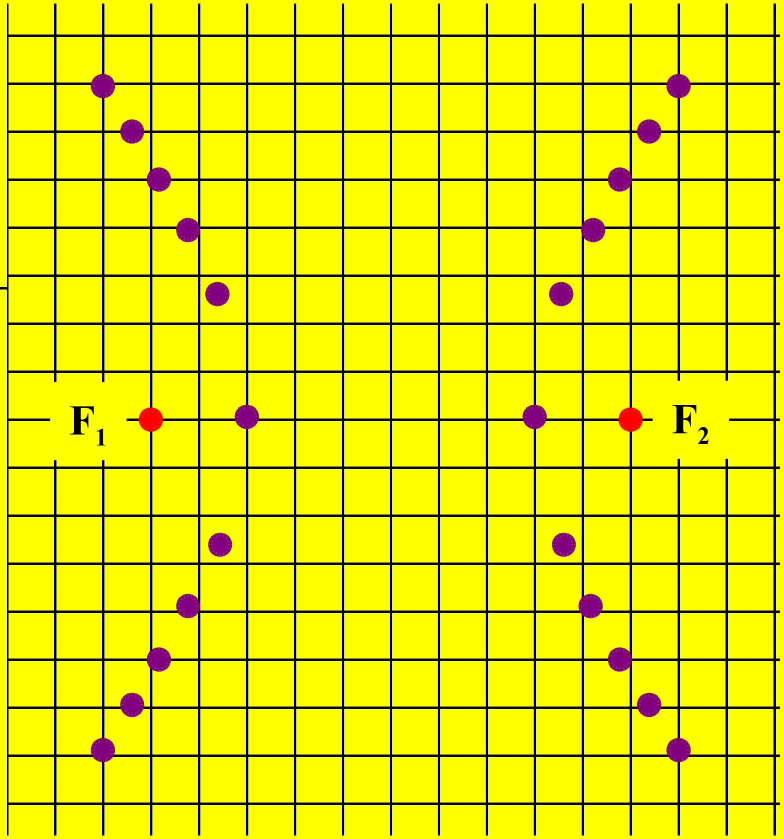
Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7
7	13



Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Distance From F_1	Distance From F_2
9	3
3	9
8	2
2	8
10	4
4	10
11	5
5	11
12	6
6	12
13	7
7	13



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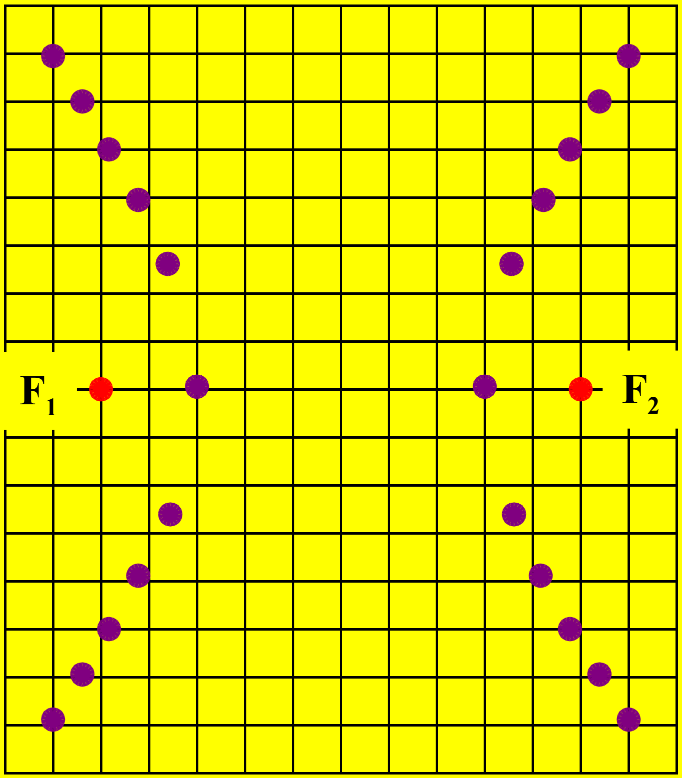
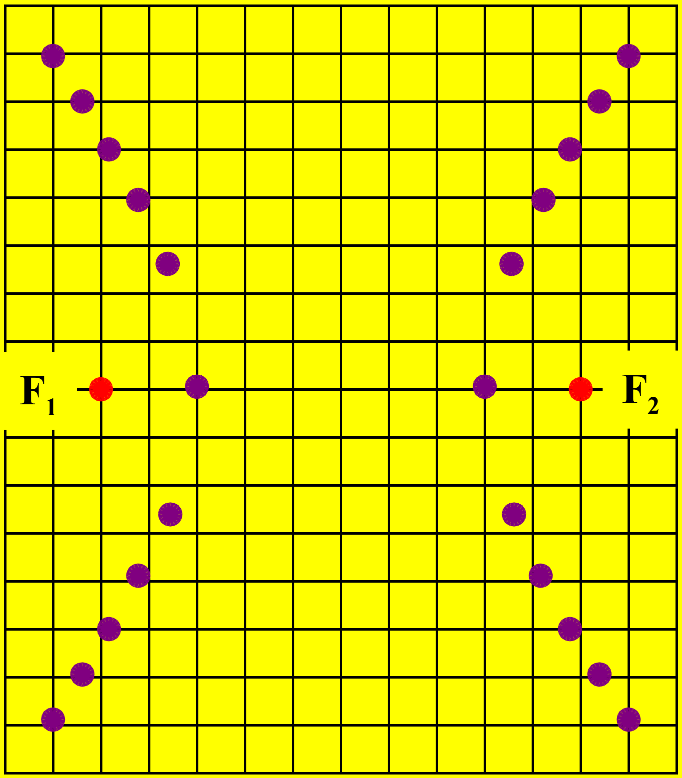


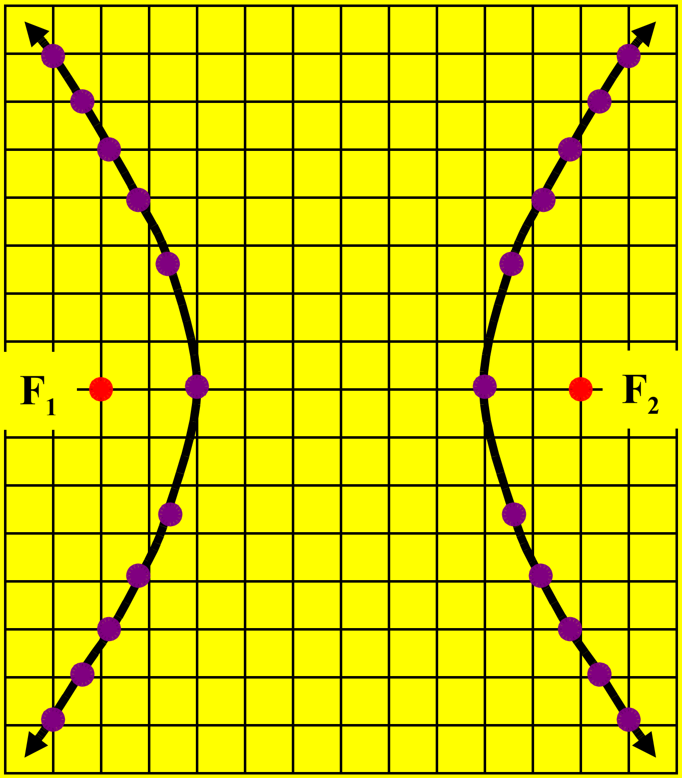
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

The graph of all points in the plane such that the difference of their distances from F_1 and F_2 is 6 units



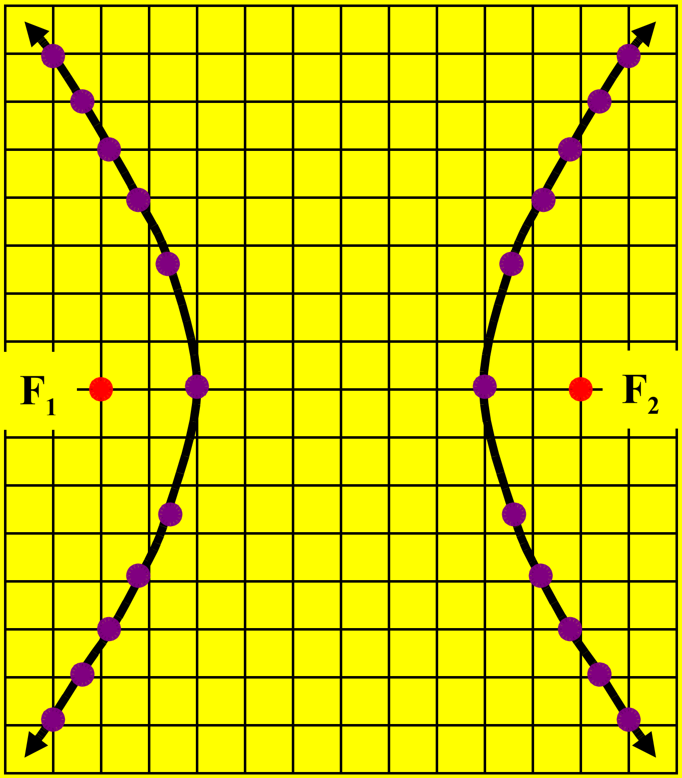
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this.



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola.



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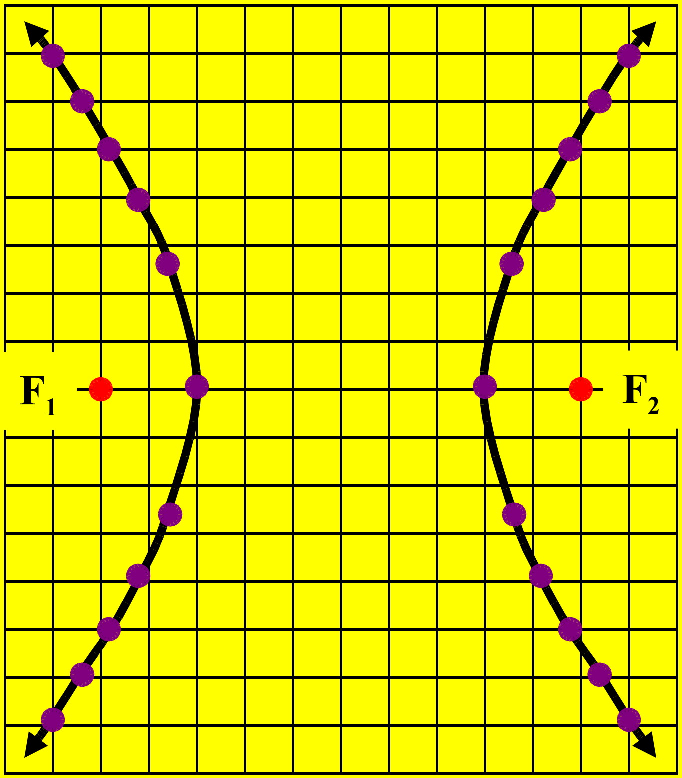
The graph of all points in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola.



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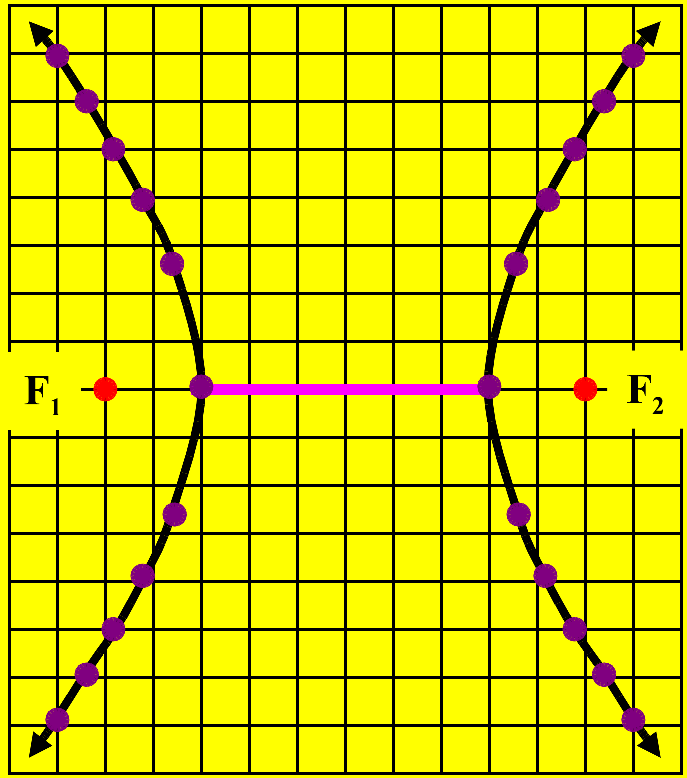

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment,

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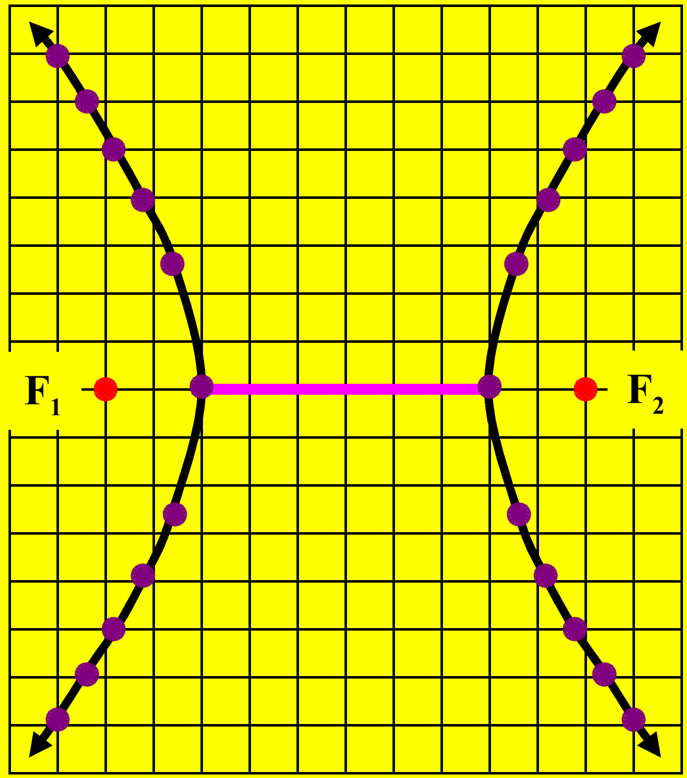
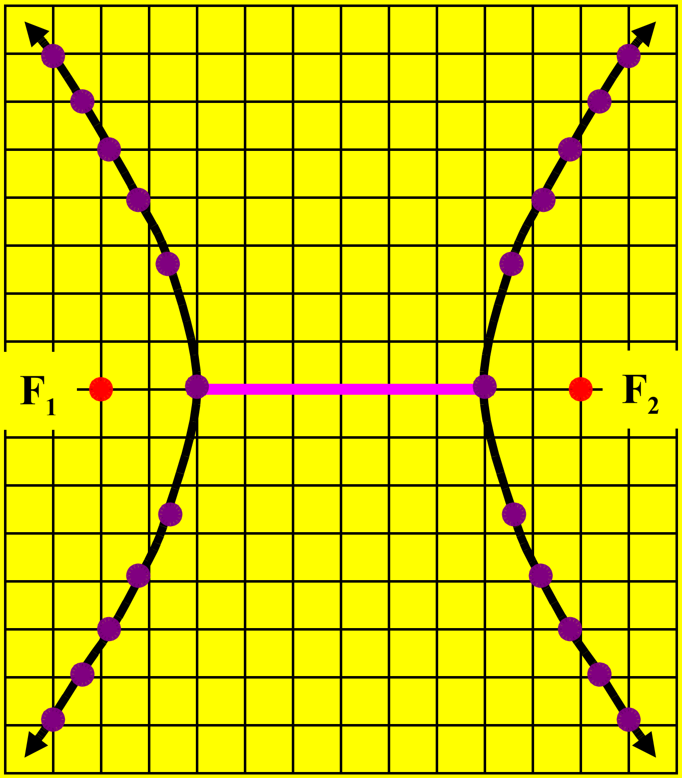


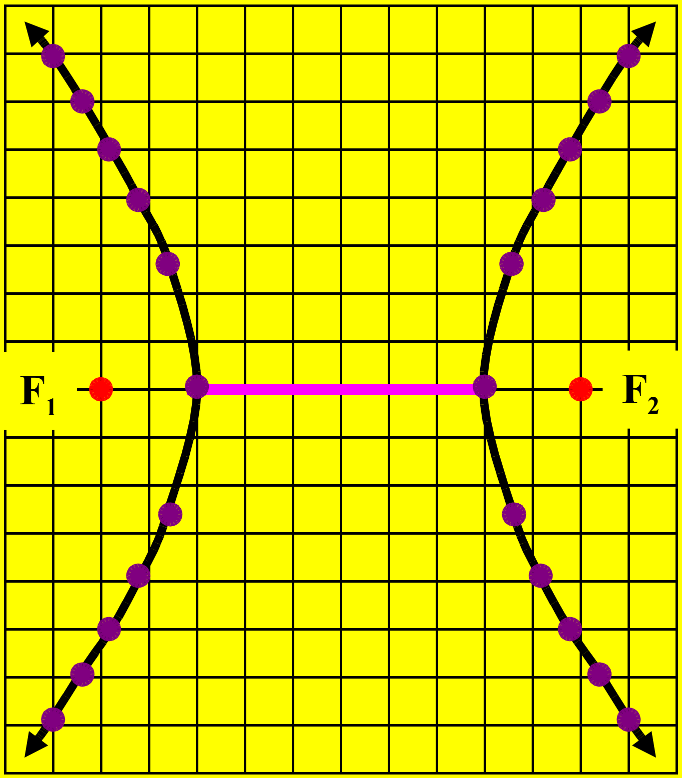
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis.



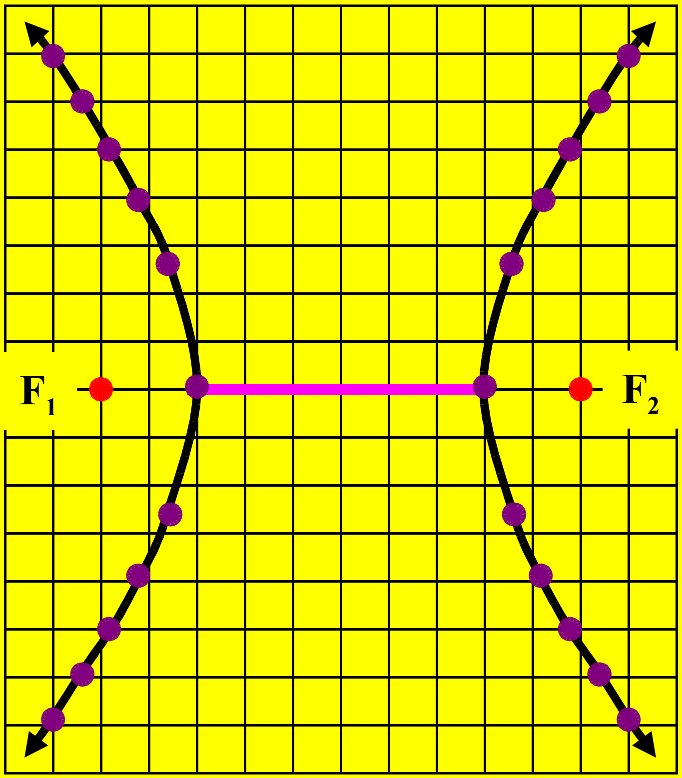
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis. The length of the transverse axis is 2a.



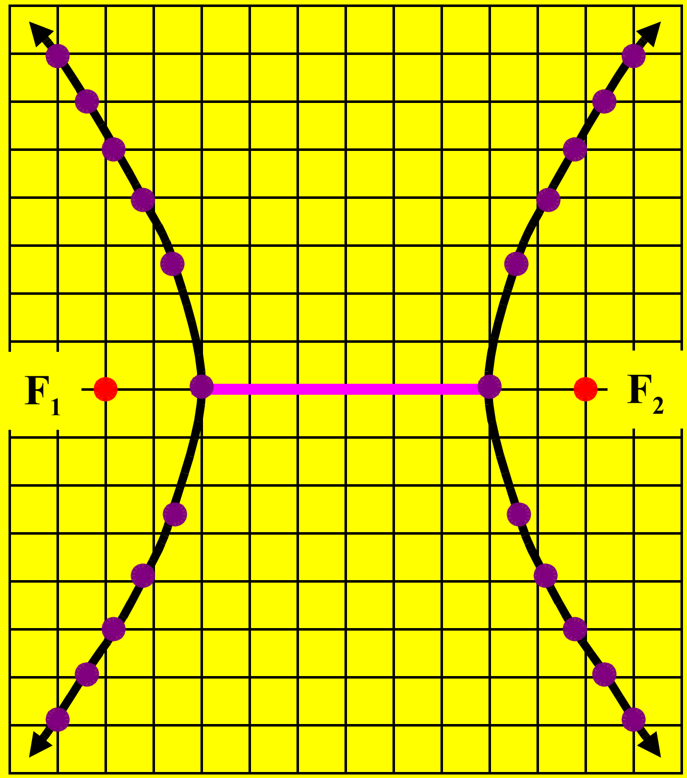
Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

The graph of all points in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis. The length of the transverse axis is 2a. In this case 2a = 6,

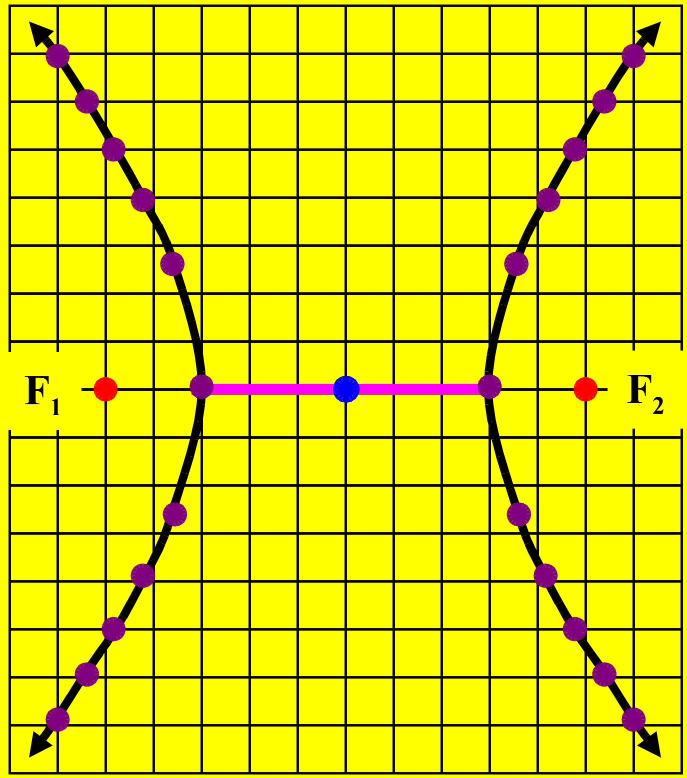


Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis. The length of the transverse axis is 2a. In this case 2a = 6, so a = 3.

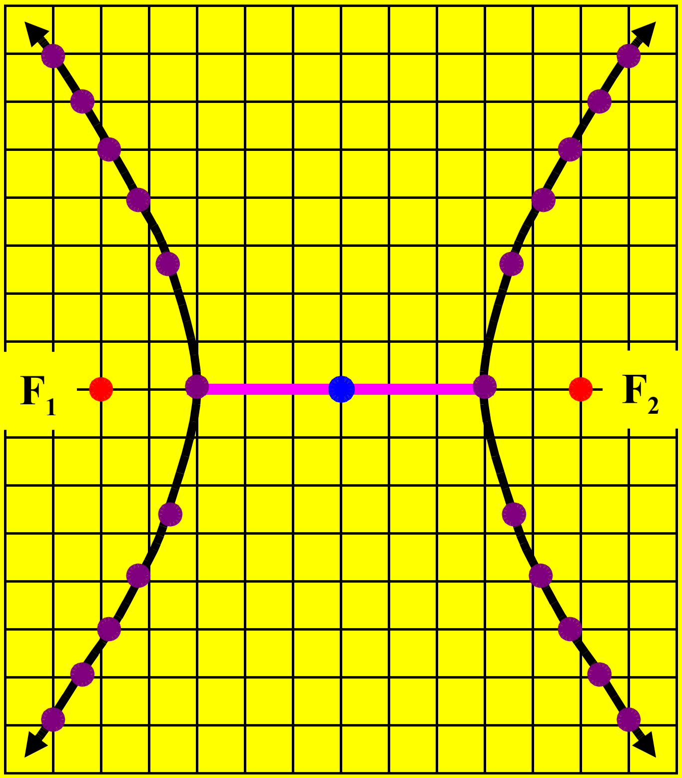


Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.



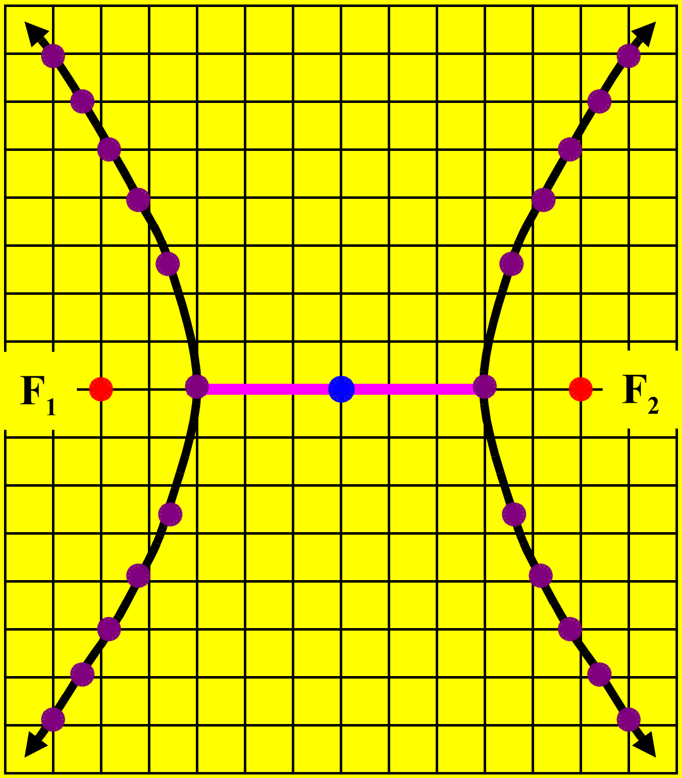
The graph of all points in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis. The length of the transverse axis is 2a. In this case 2a = 6, so a = 3. The midpoint of the transverse axis is the 'center' of the hyperbola.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.



The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis. The length of the transverse axis is 2a. In this case 2a = 6, so a = 3. The midpoint of the transverse axis is the 'center' of the hyperbola. The distance from the center of the hyperbola to each focus is c.

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.



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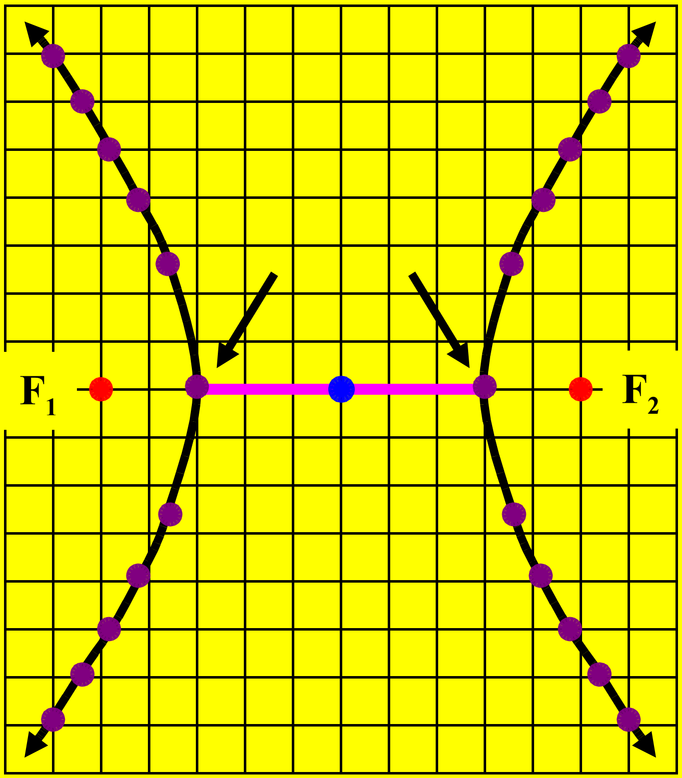
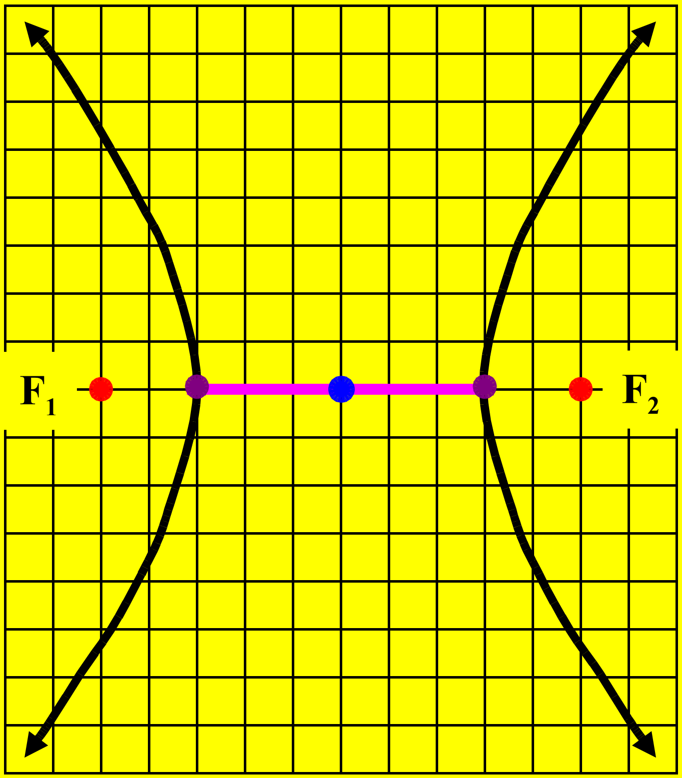
Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

The graph of <u>all points</u> in the plane such that the difference of their distances from F_1 and F_2 is 6 units looks like this. This shape is called a hyperbola. F_1 and F_2 are foci of the hyperbola. This segment, connecting the two branches of the hyperbola, is called the transverse axis. The length of the transverse axis is 2a. In this case 2a = 6, so a = 3. The midpoint of the transverse axis is the 'center' of the hyperbola. The distance from the center of the hyperbola to each focus is c. In this case c = 5. Each endpoint of the transverse axis is called a vertex of the hyperbola.

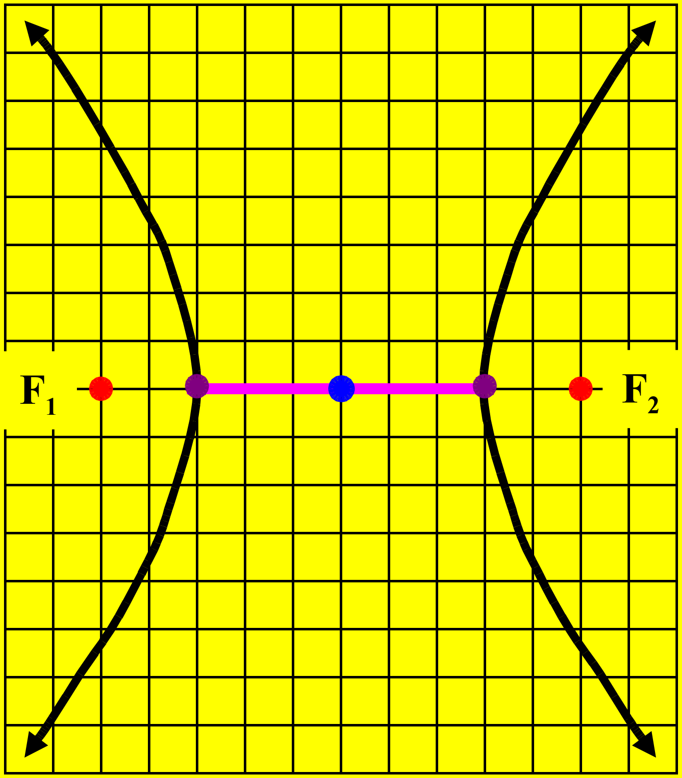


Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.



Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Next, we will add the coordinate axes to the diagram



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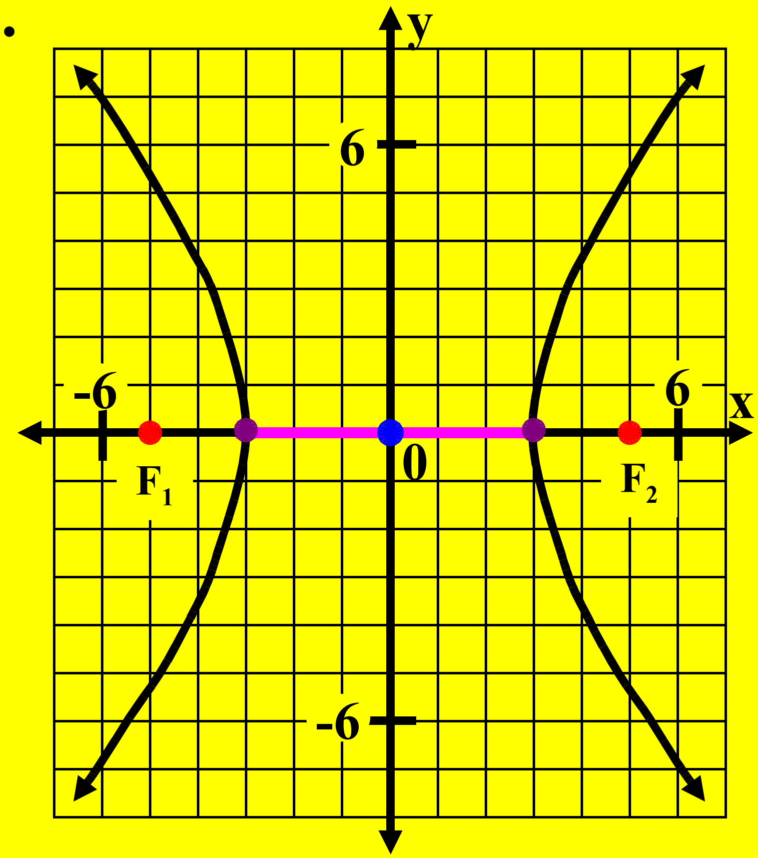
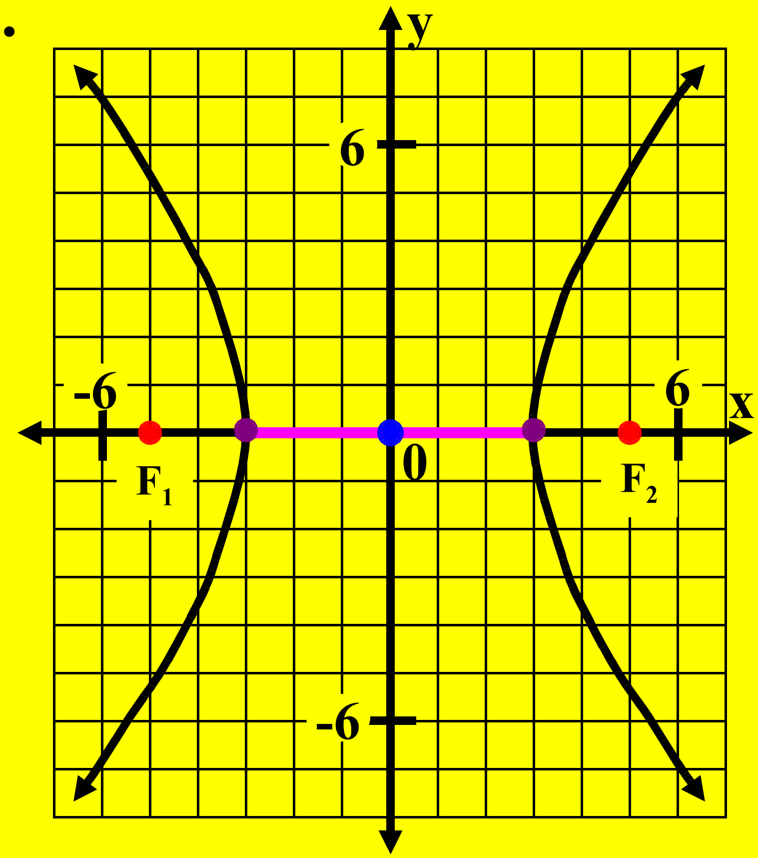


Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola.



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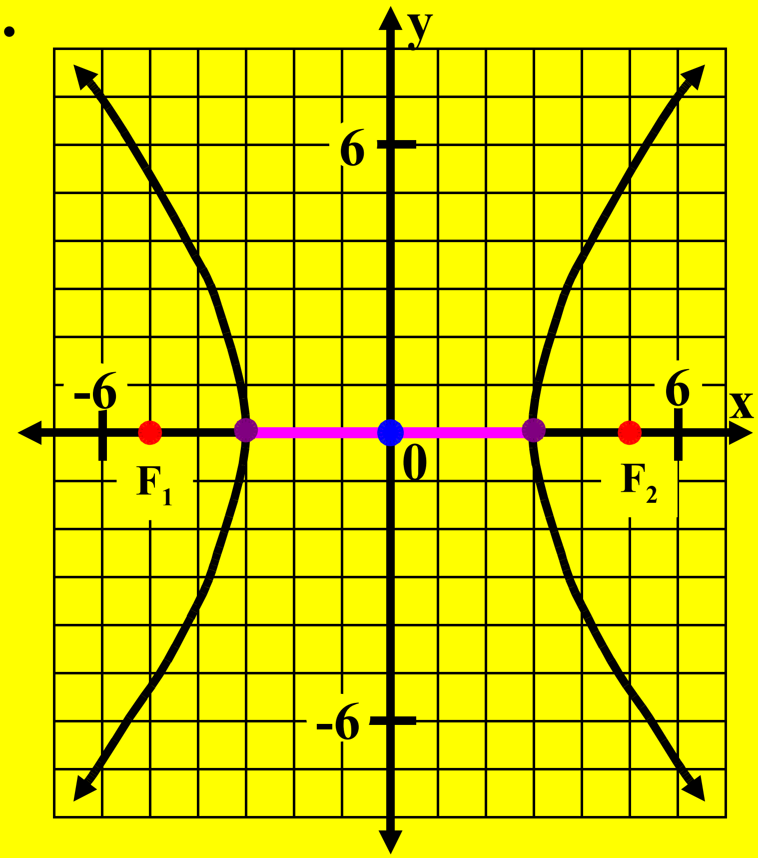
This hyperbola has two branches.



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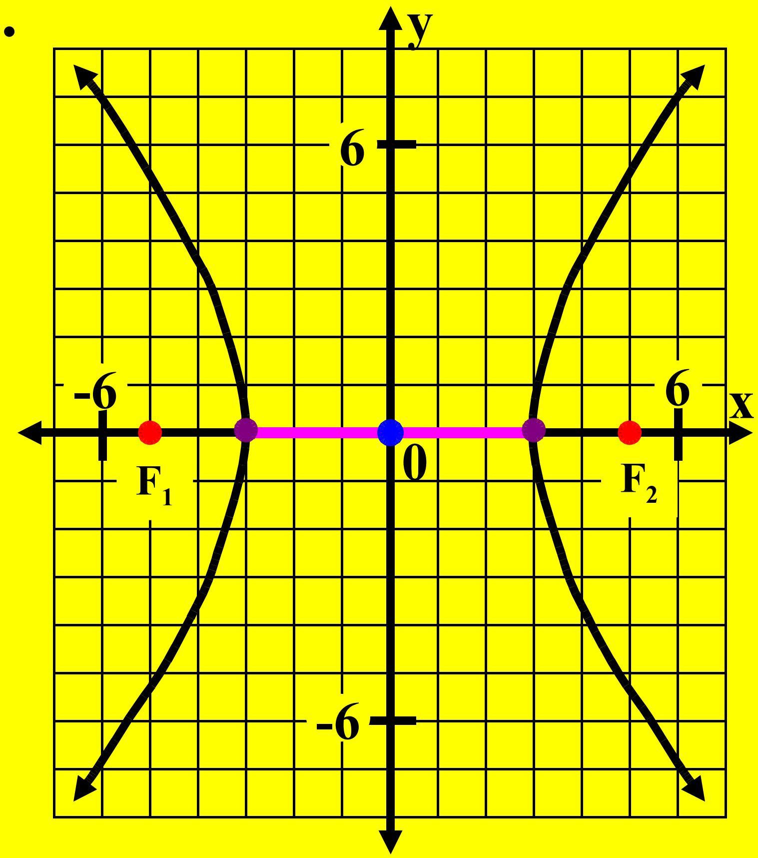
Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately.



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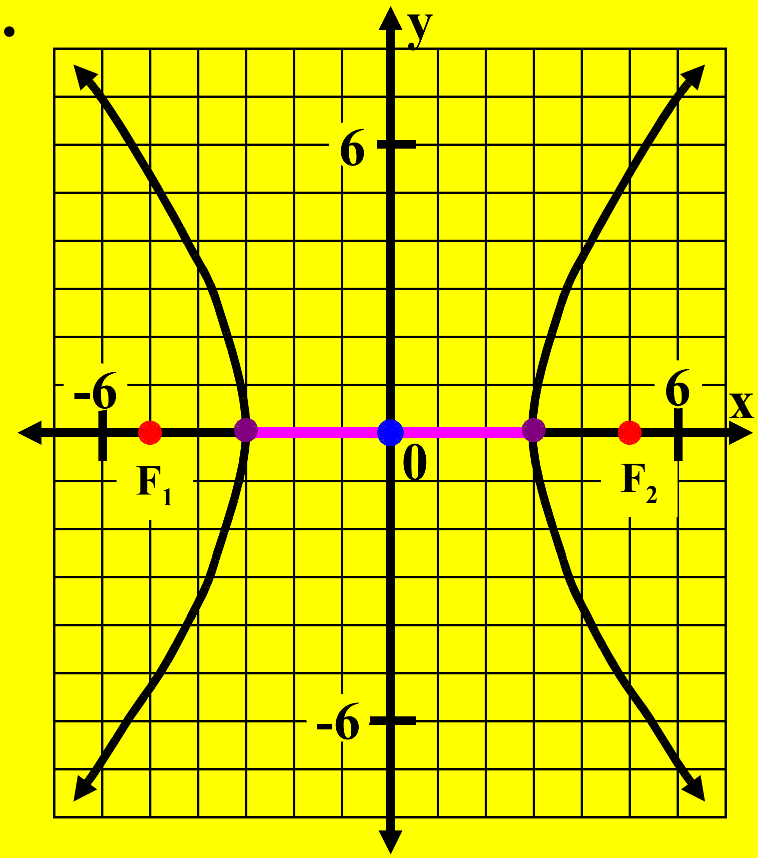

Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately. If point P(x, y) represents any point on the 'left branch' of the hyperbola,

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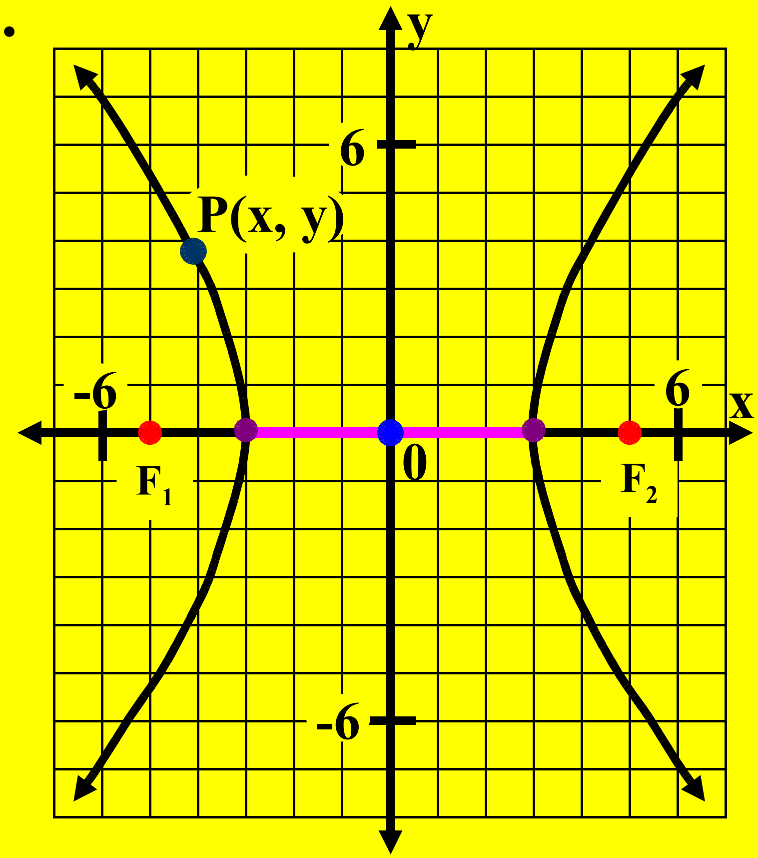

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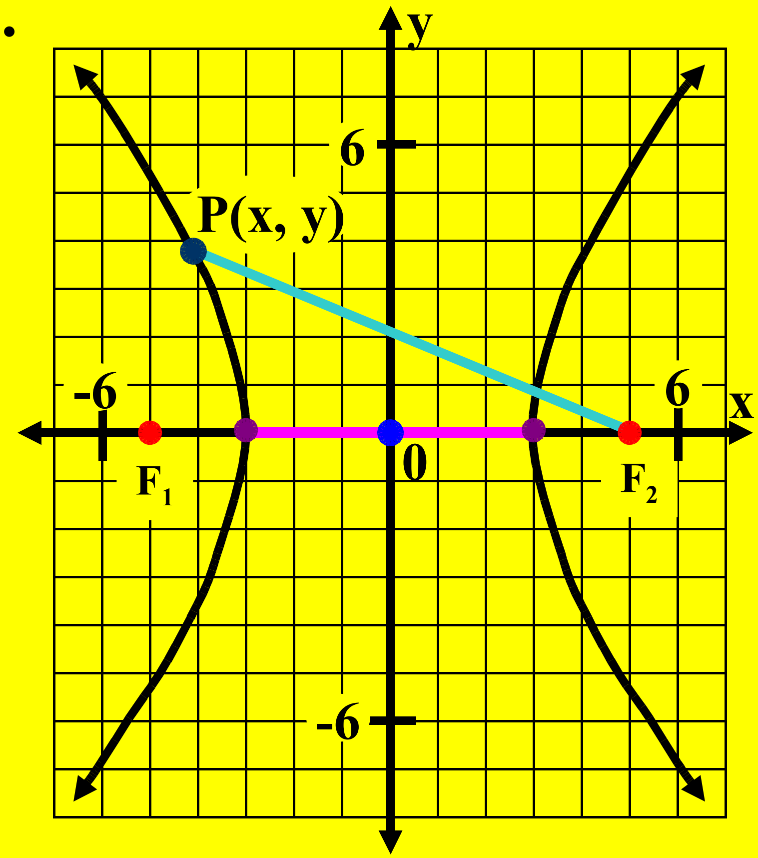

PF_2

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

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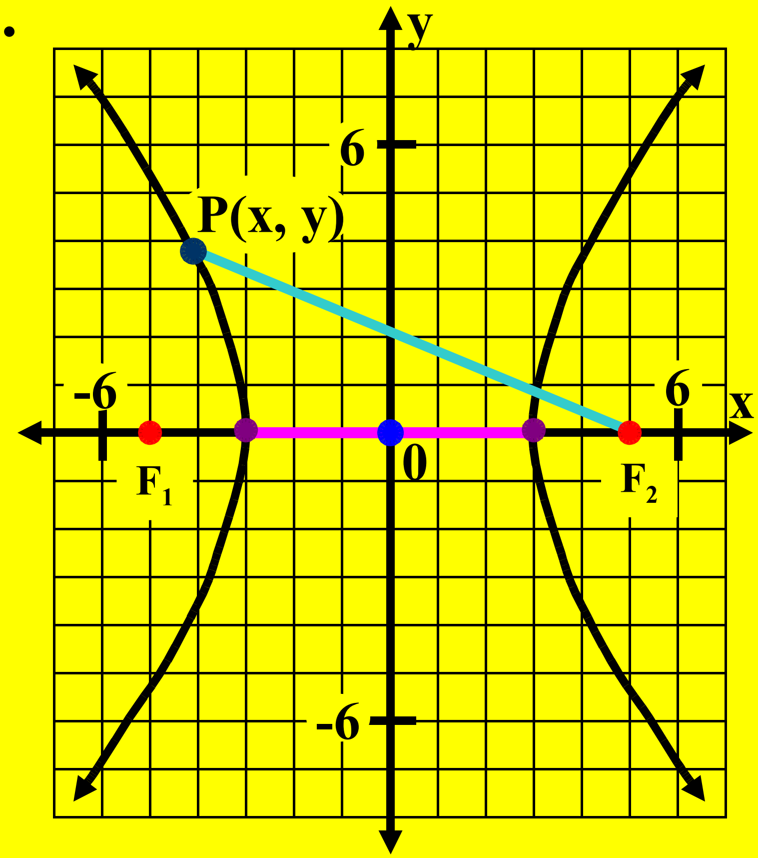

PF_2 –

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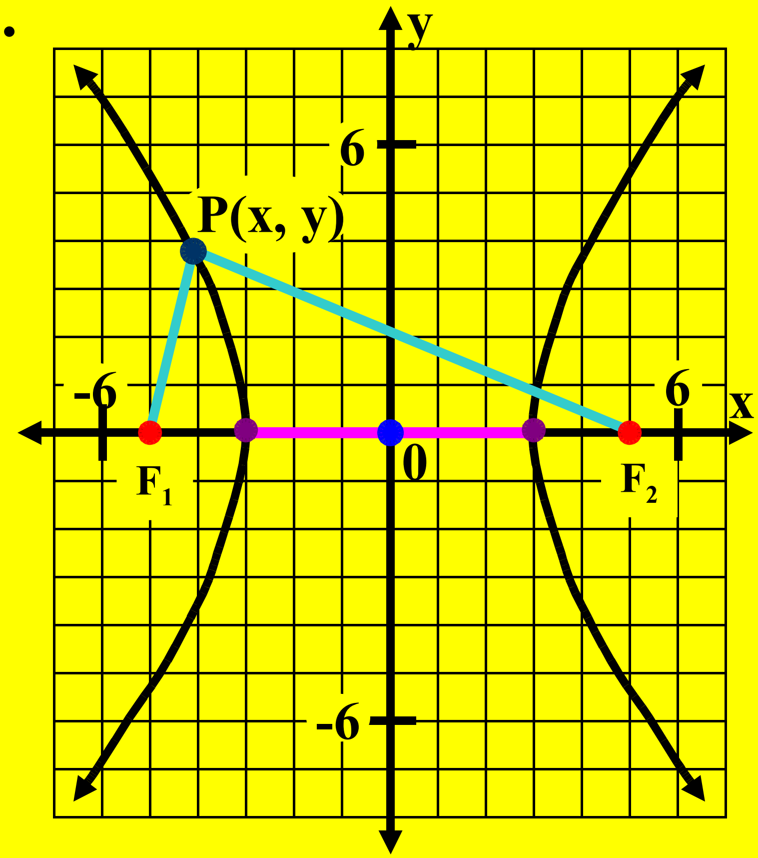

$$PF_2 - PF_1$$

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

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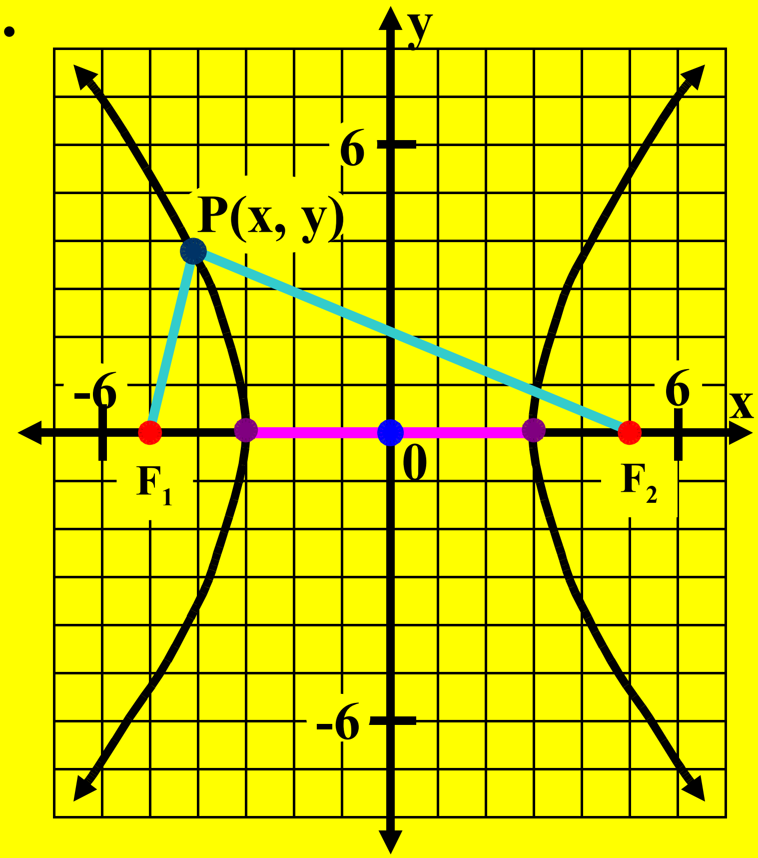
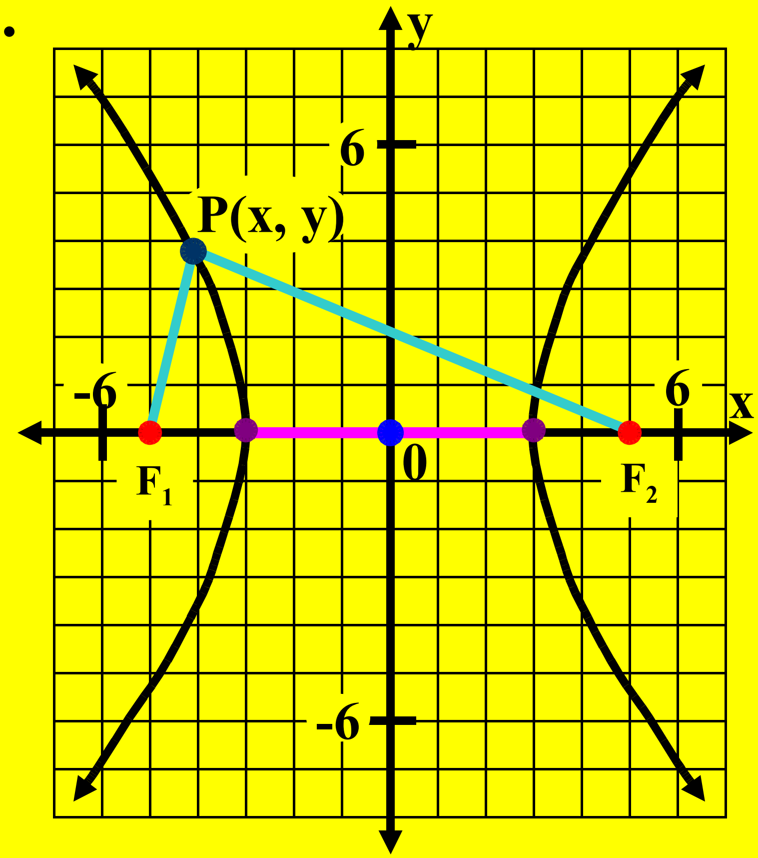


$$PF_2 - PF_1 = 6$$

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

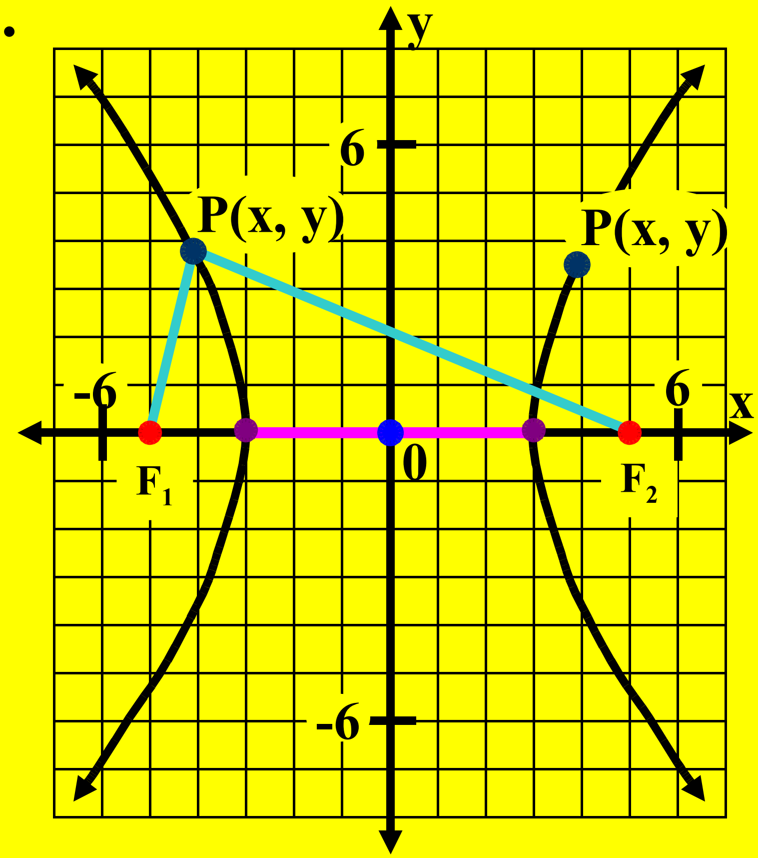
Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately. If point P(x, y) represents any point on the 'left branch' of the hyperbola, then



$$PF_2 – PF_1 = 6$$

If point P(x, y) represents any point on the 'right branch' of the hyperbola,

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.



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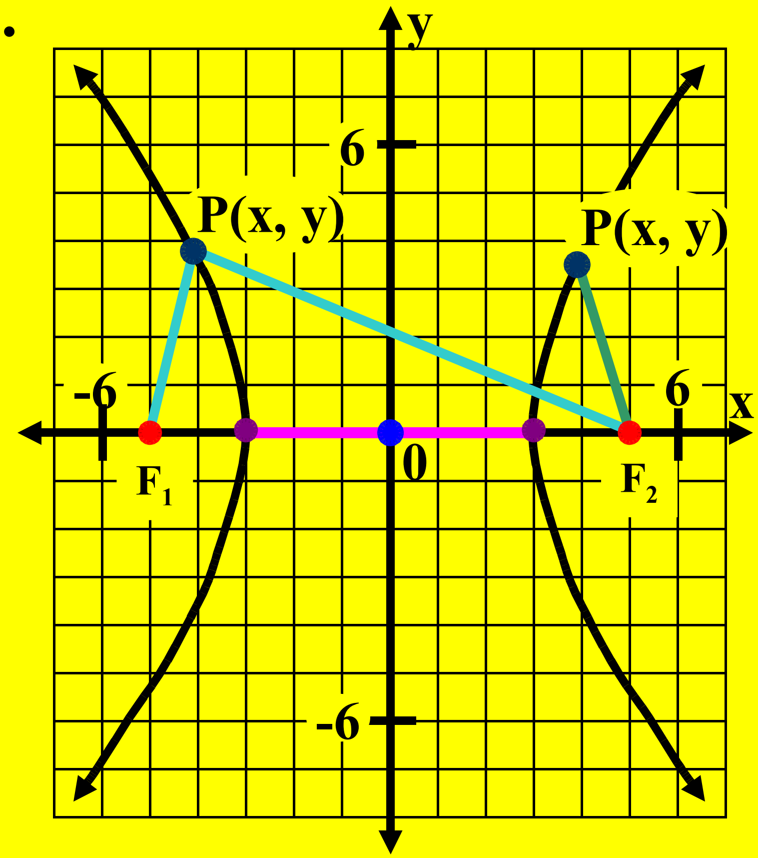
$$PF_2 - PF_1 = 6$$

If point P(x, y) represents any point on the 'right branch' of the hyperbola,

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.



Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately. If point P(x, y) represents any point on the 'left branch' of the hyperbola, then

$$PF_2 – PF_1 = 6$$

If point P(x, y) represents any point on the 'right branch' of the hyperbola, then PF_2

Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

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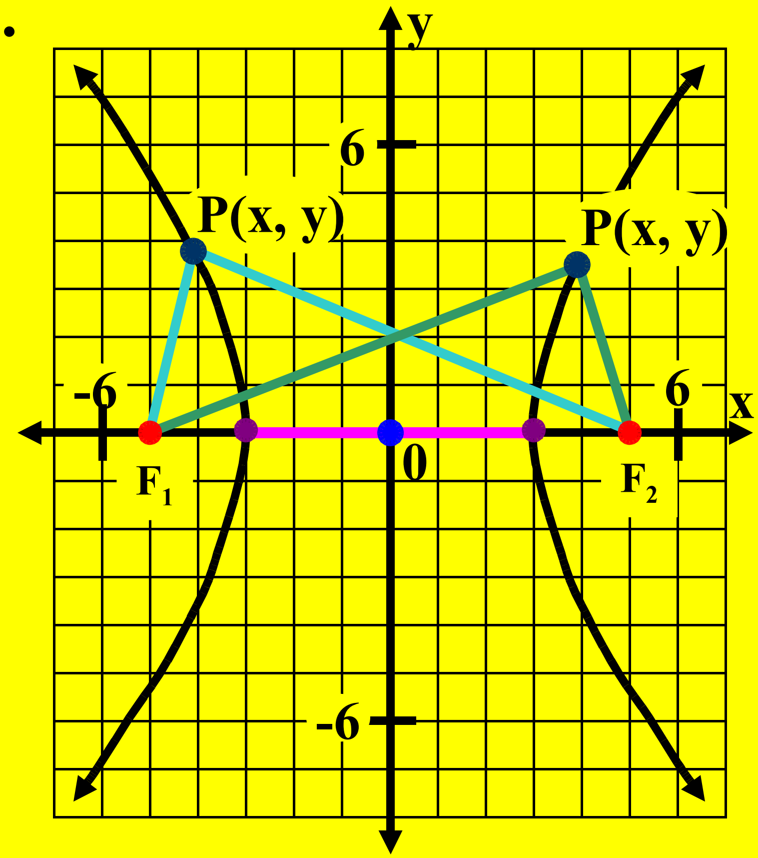
$$PF_2 - PF_1 = 6$$

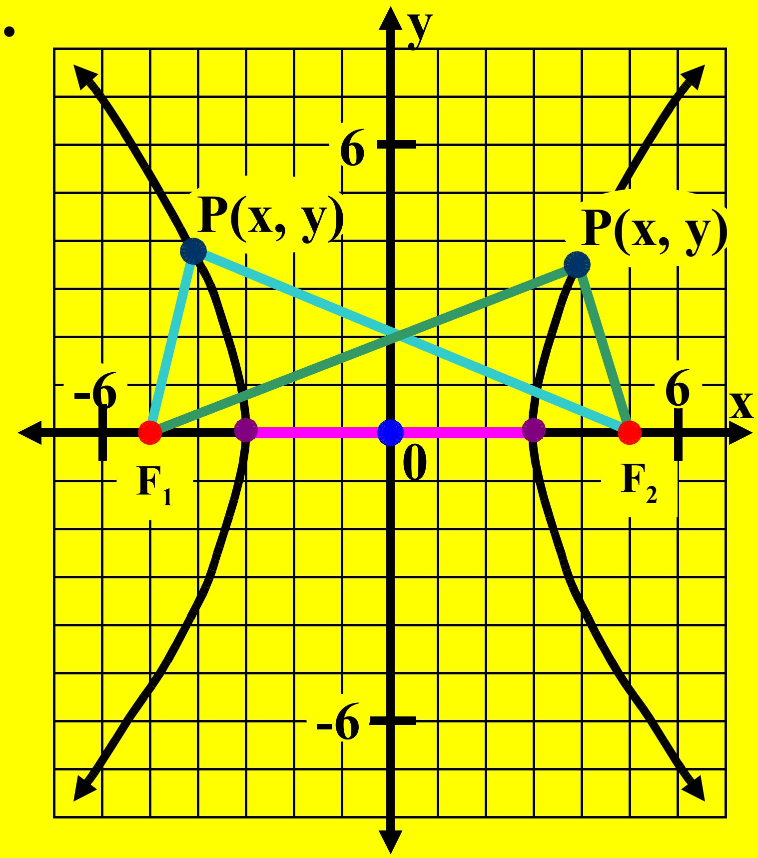


If point P(x, y) represents any point on the 'right branch' of the hyperbola, then $PF_2 - PF_1$

Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately. If point P(x, y) represents any point on the 'left branch' of the hyperbola, then

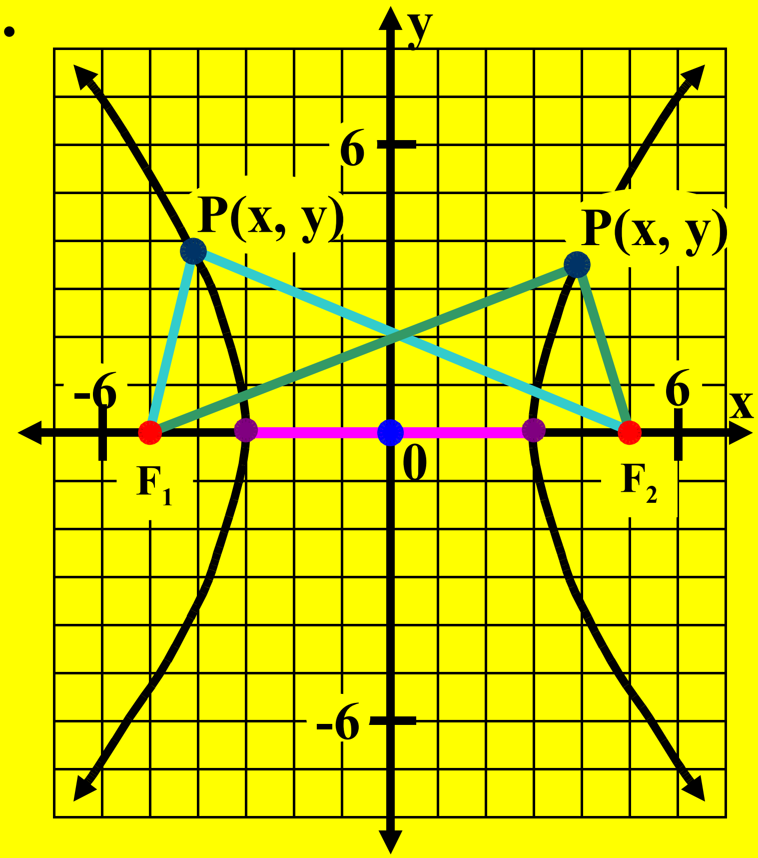
$$PF_2 - PF_1 = 6$$



If point P(x, y) represents any point on the 'right branch' of the hyperbola, then $PF_2 - PF_1 = -6$

Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately. If point P(x, y) represents any point on the 'left branch' of the hyperbola, then

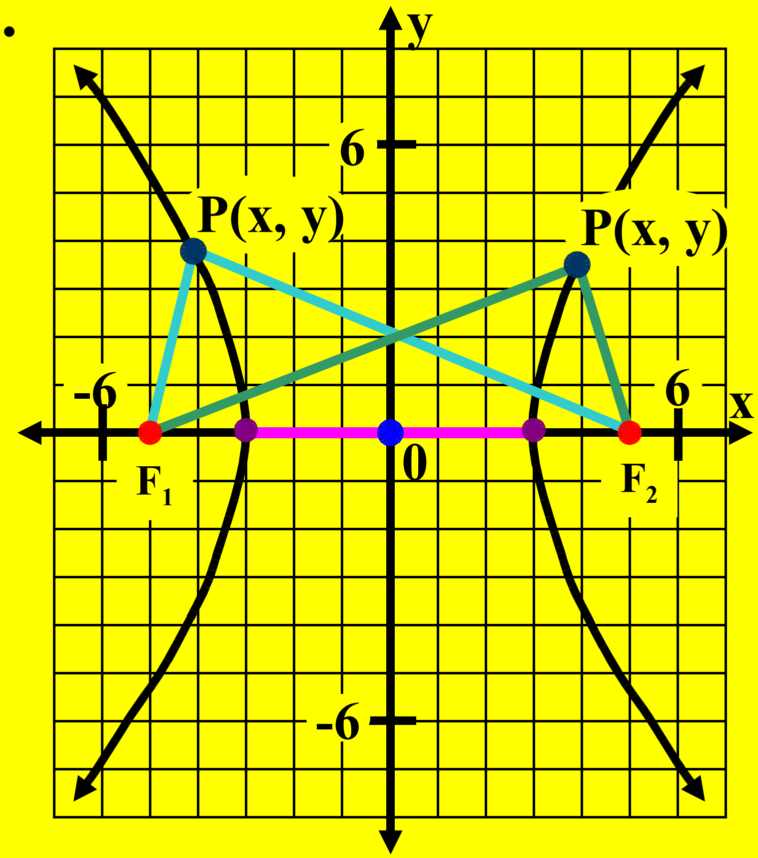


$$PF_2 - PF_1 = 6$$

If point P(x, y) represents any point on the 'right branch' of the hyperbola, then $PF_2 - PF_1 = -6$

Therefore, if P(x, y) represents any point on the hyperbola, then

Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.



Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola. This hyperbola has two branches. For now we will treat them separately. If point P(x, y) represents any point on the 'left branch' of the hyperbola, then

$$PF_2 - PF_1 = 6$$

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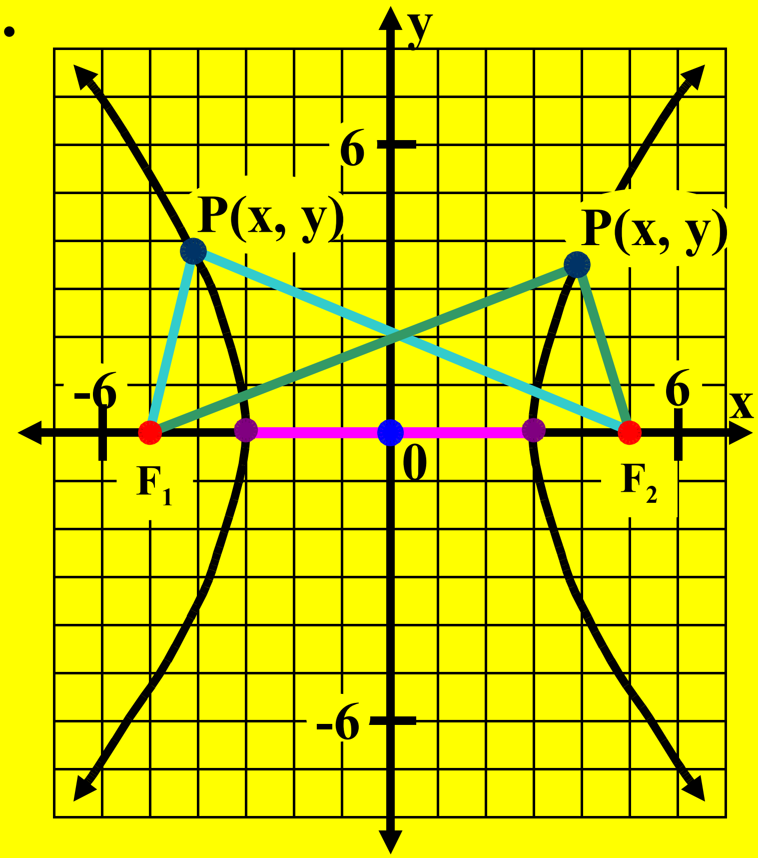

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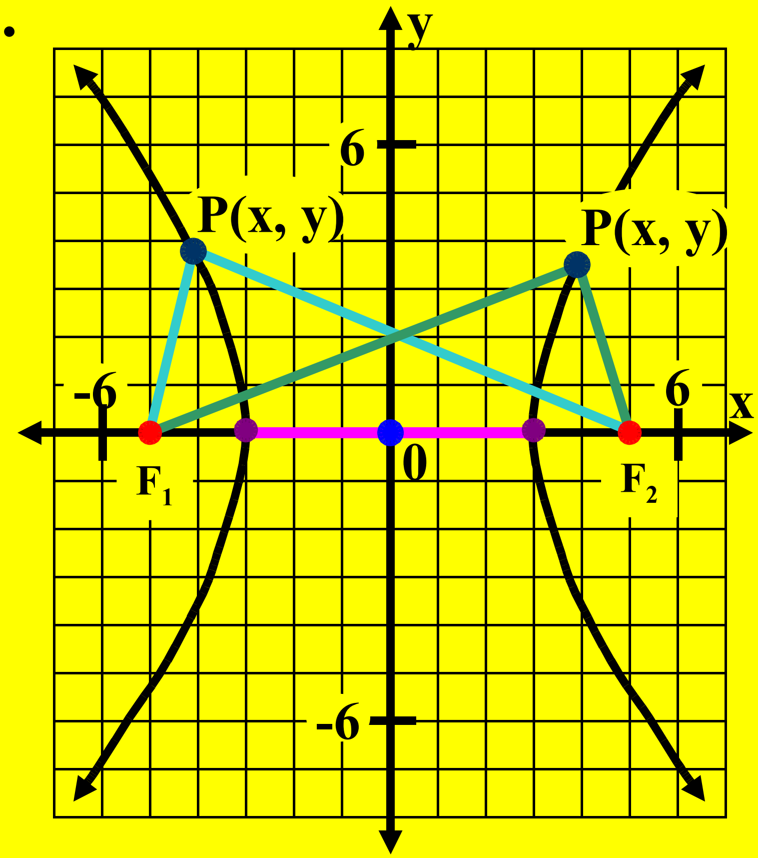

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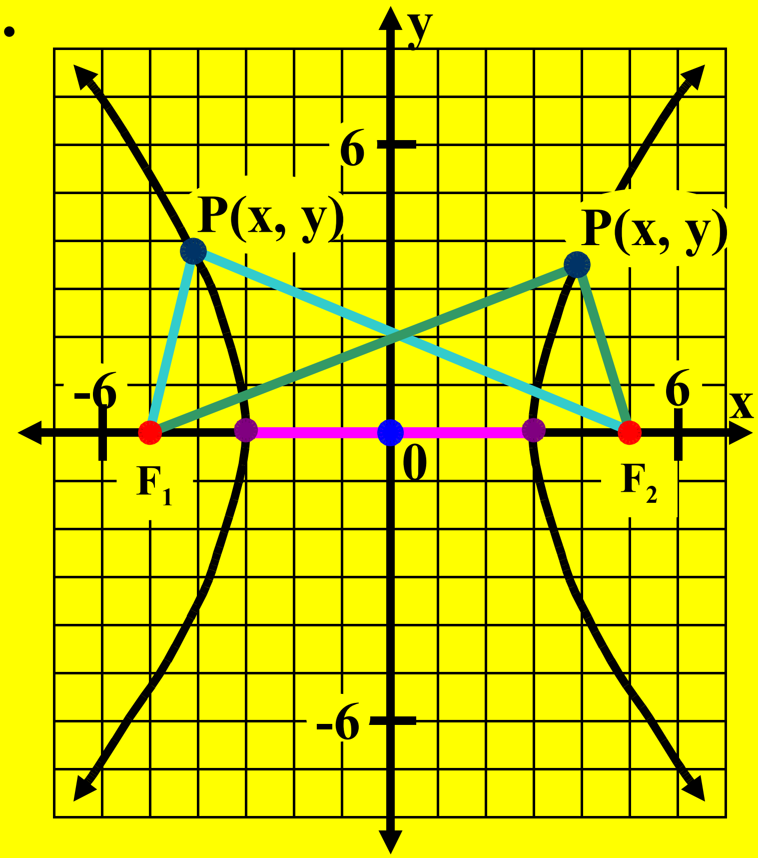

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Given any two points in a plane, we want to consider all points in the plane such that the <u>difference</u> of their distances from the two given points is 6 units.

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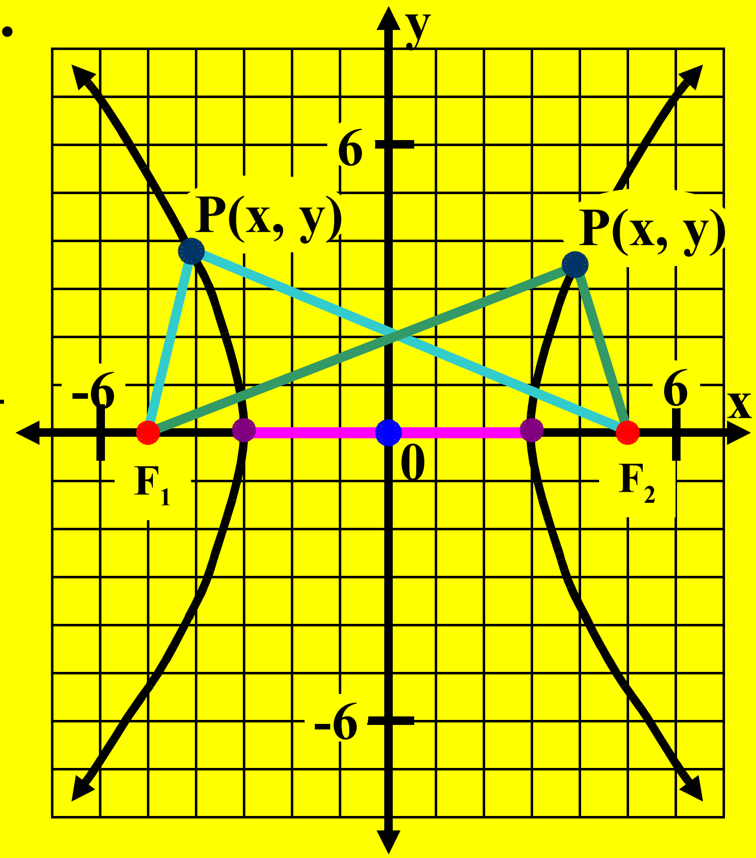

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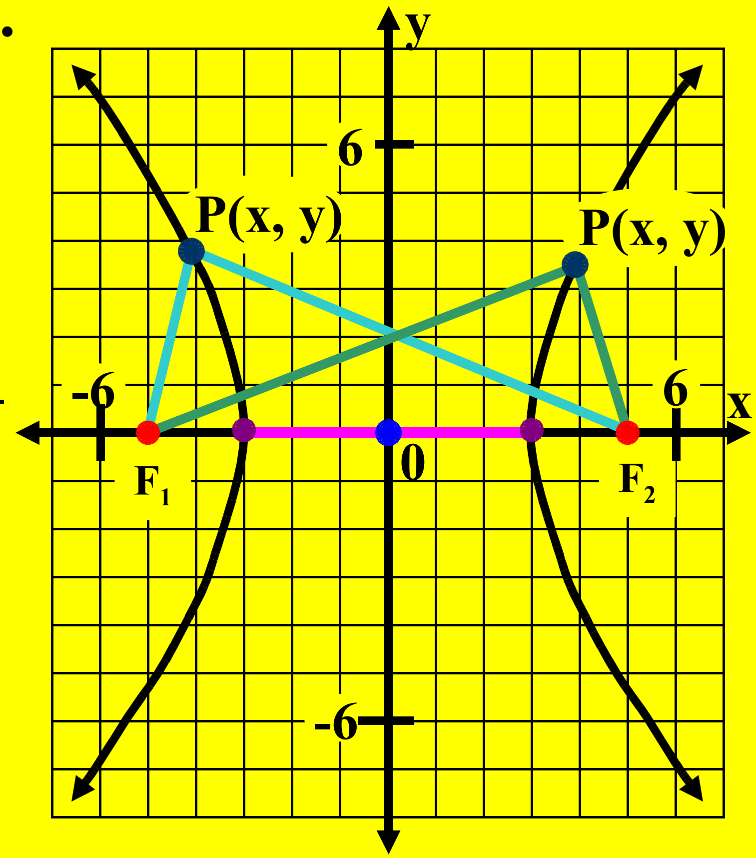
The coordinates of F_2 are (5, 0).



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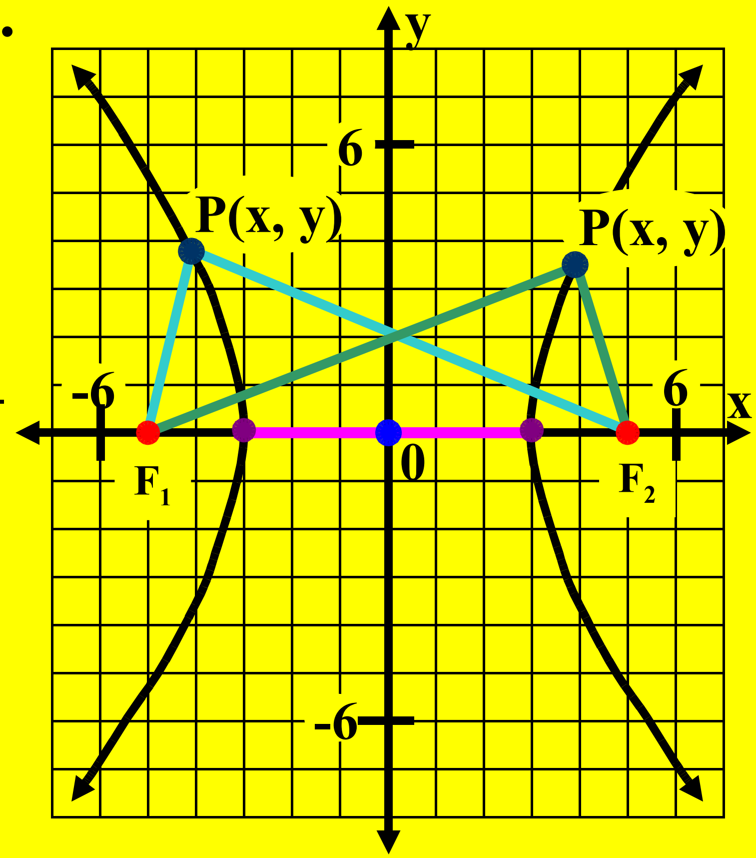

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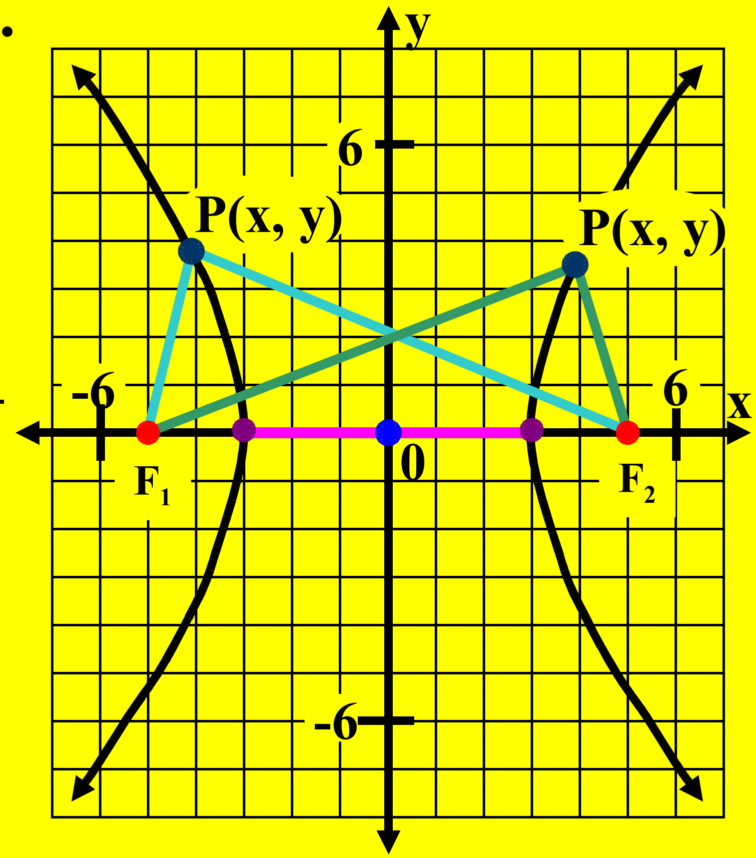

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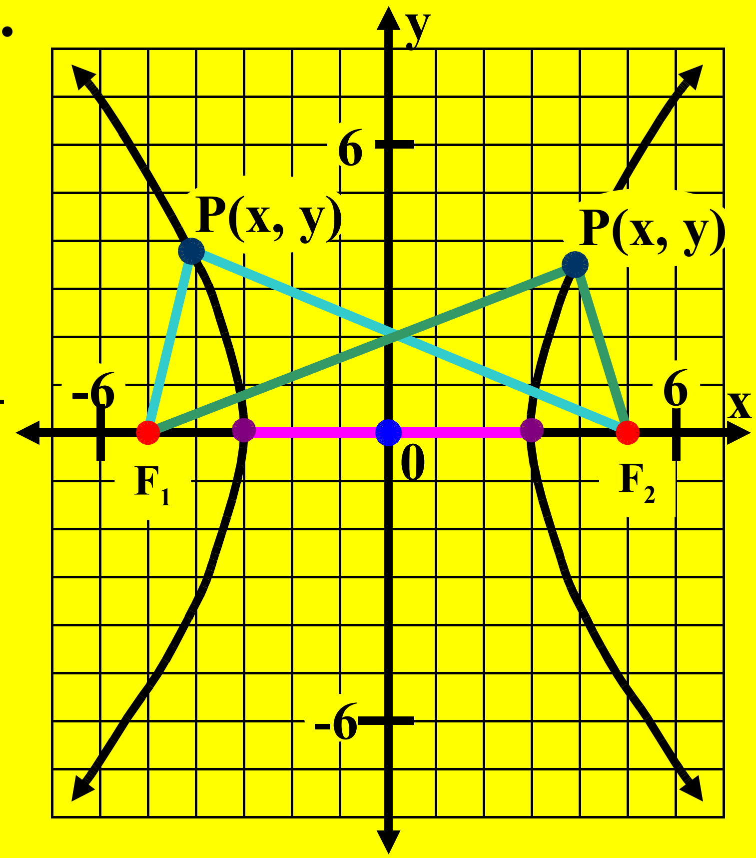

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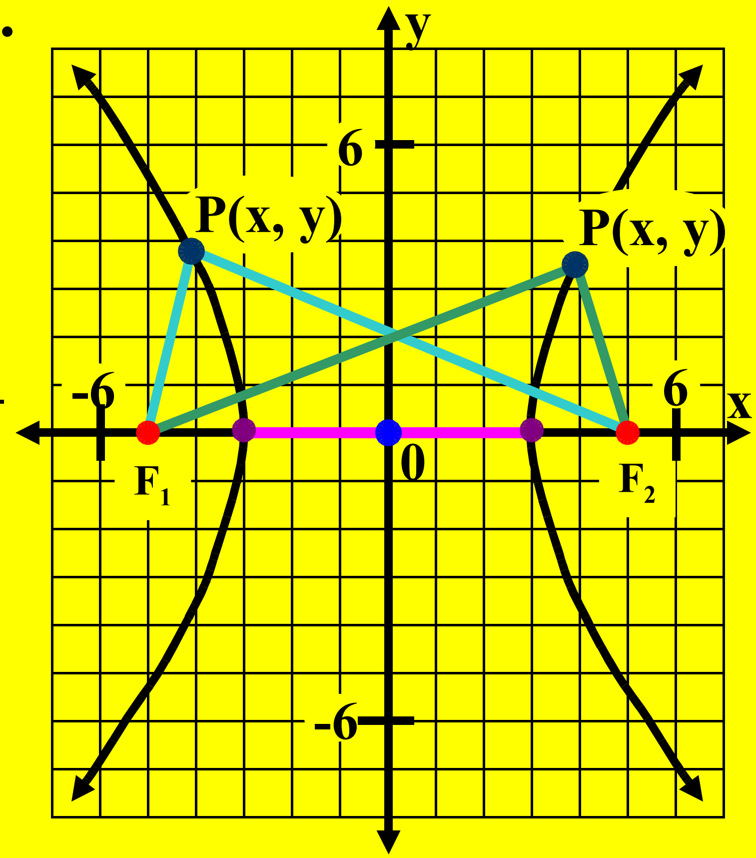

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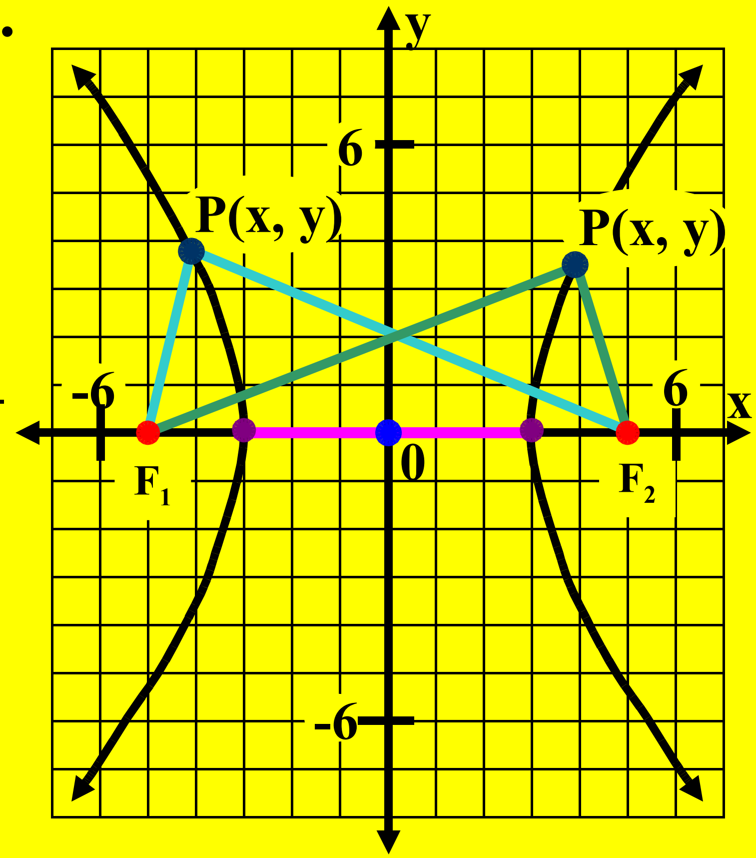

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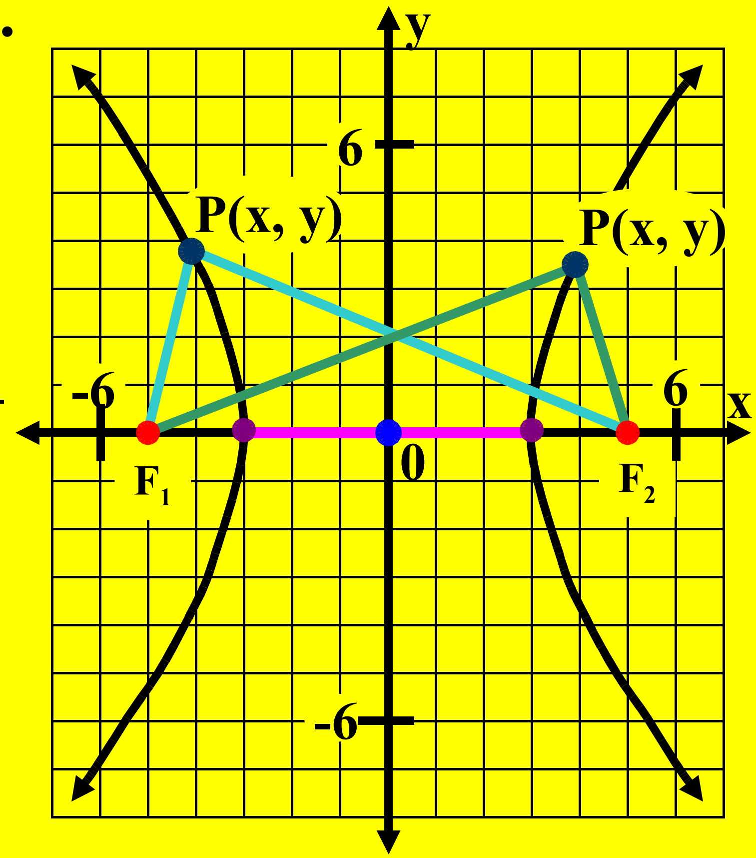

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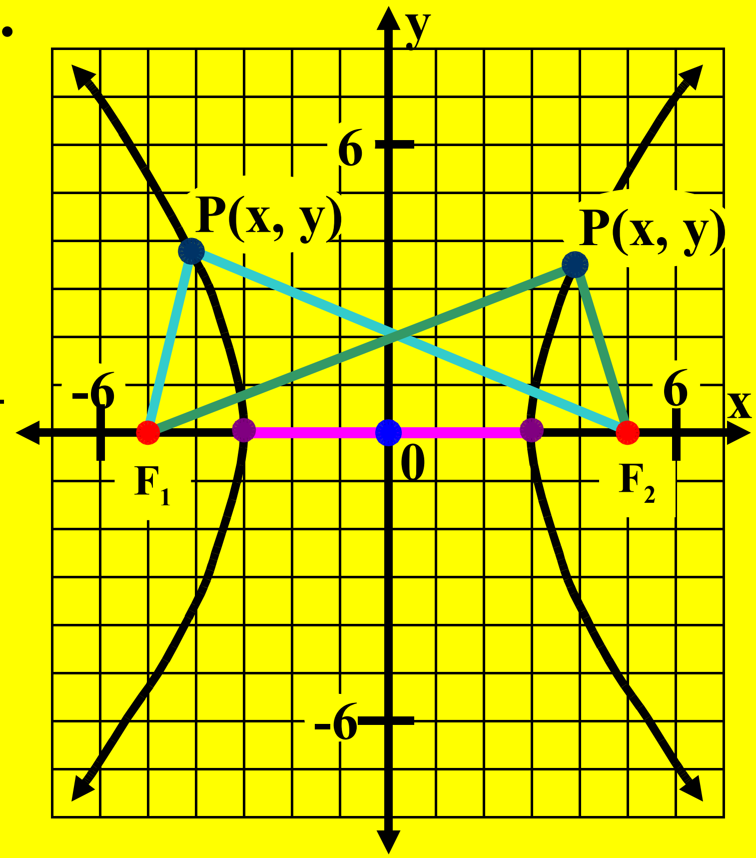

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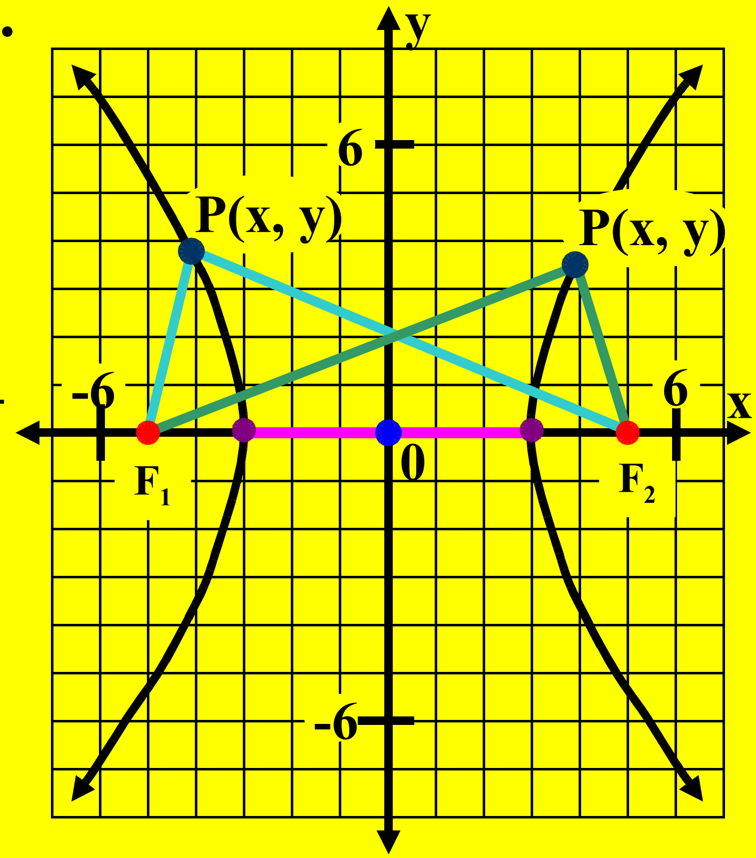

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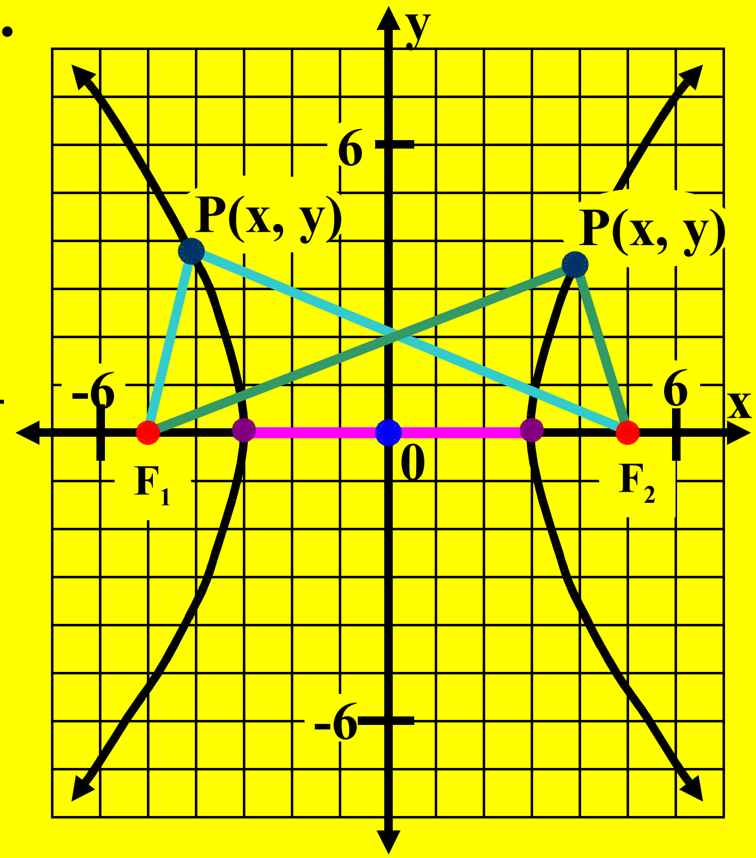

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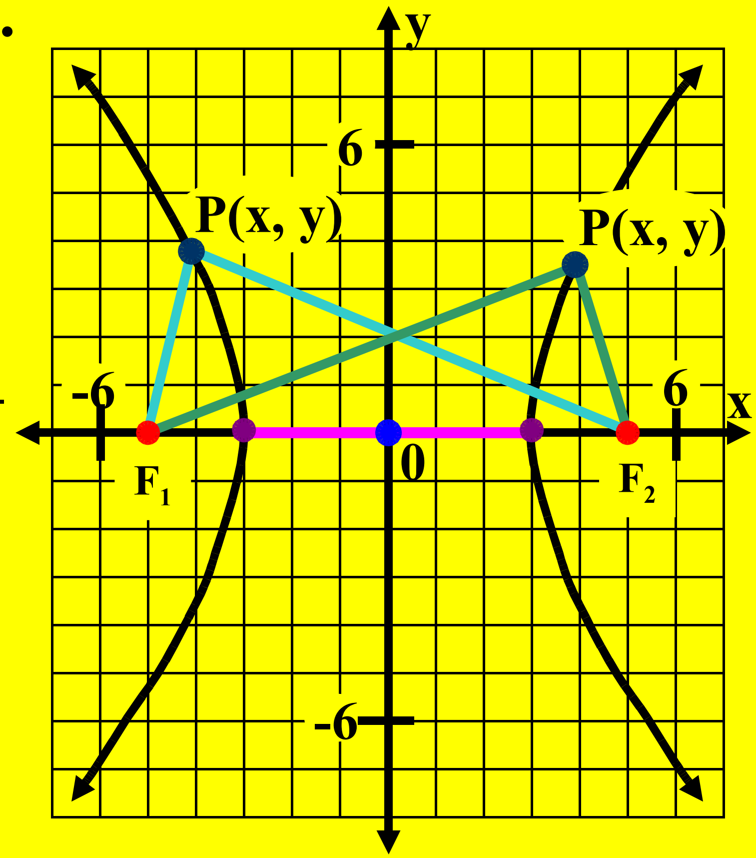

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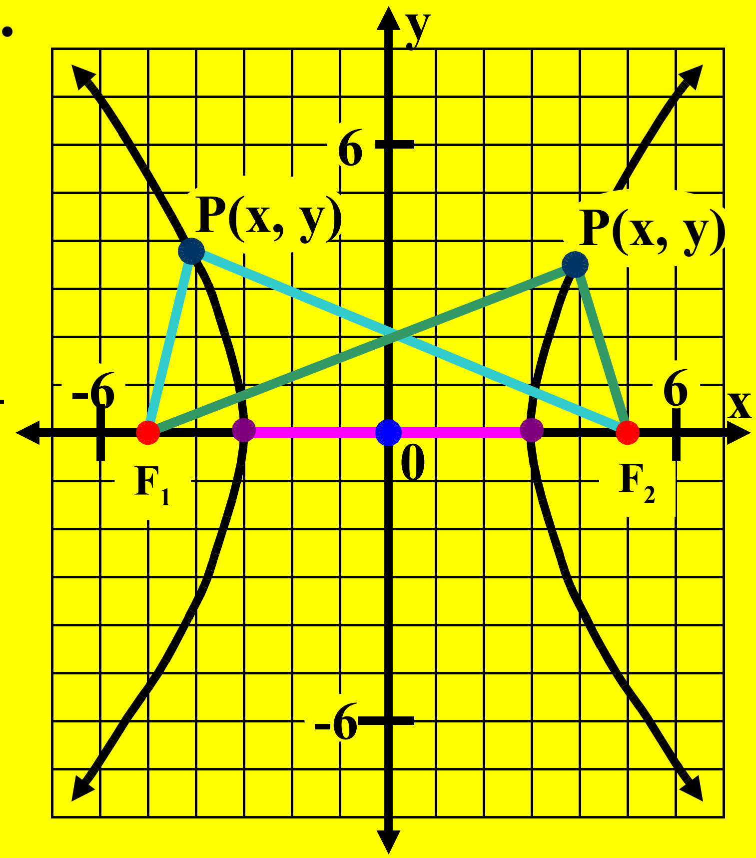

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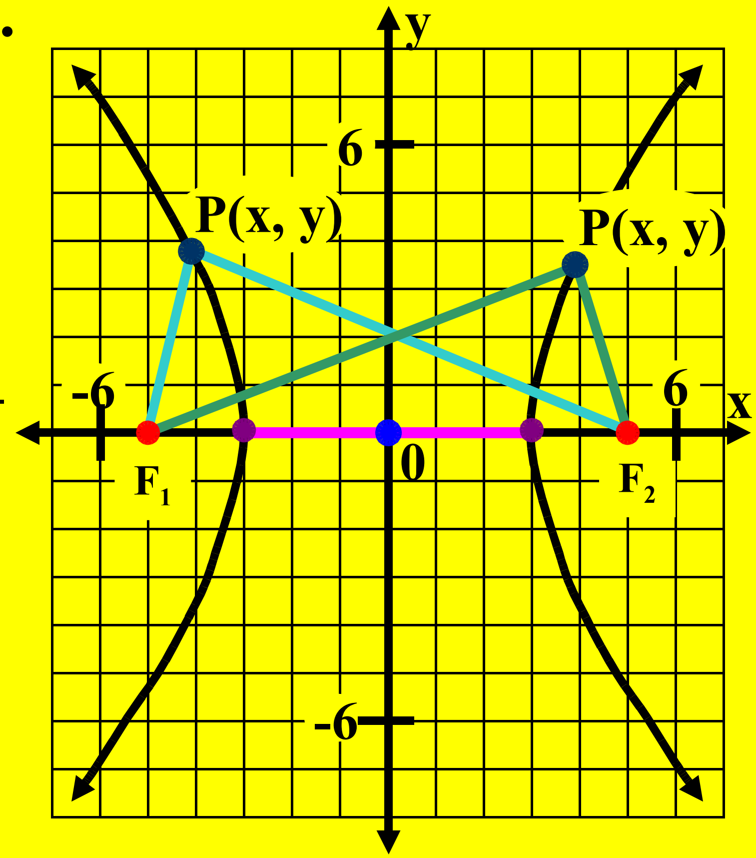

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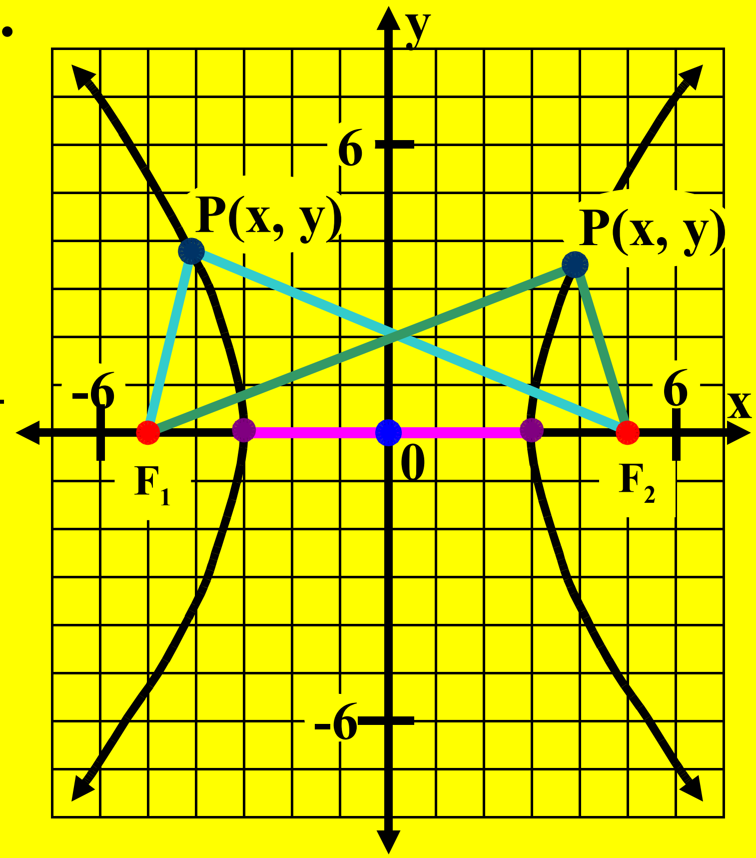

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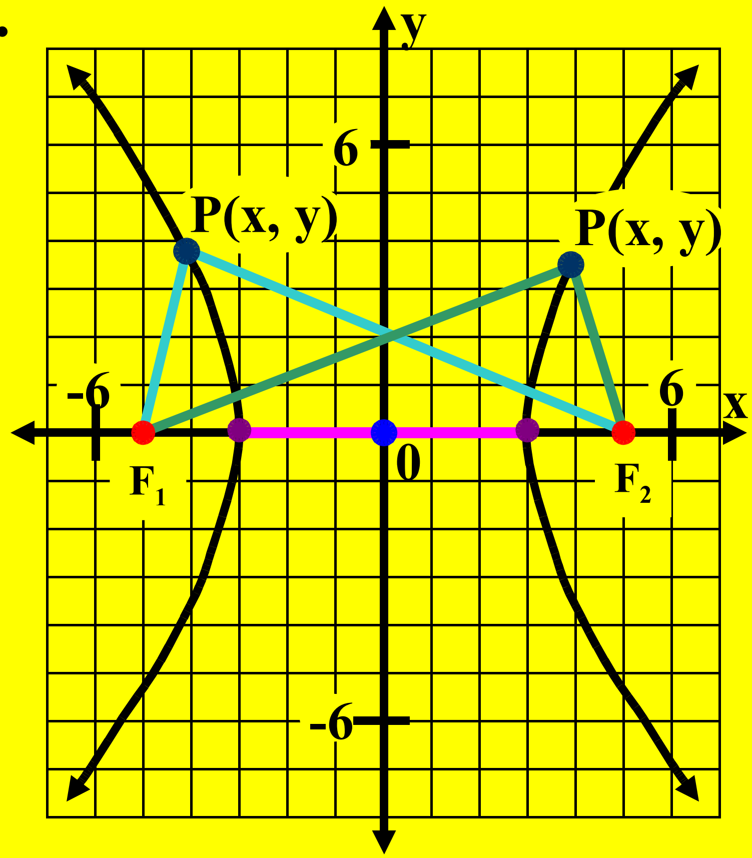

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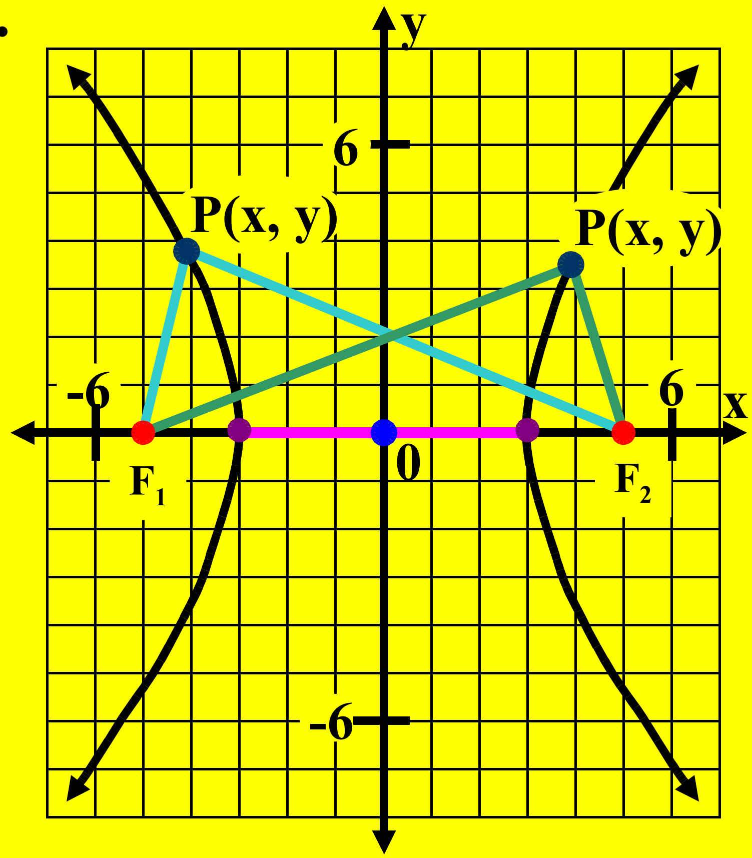

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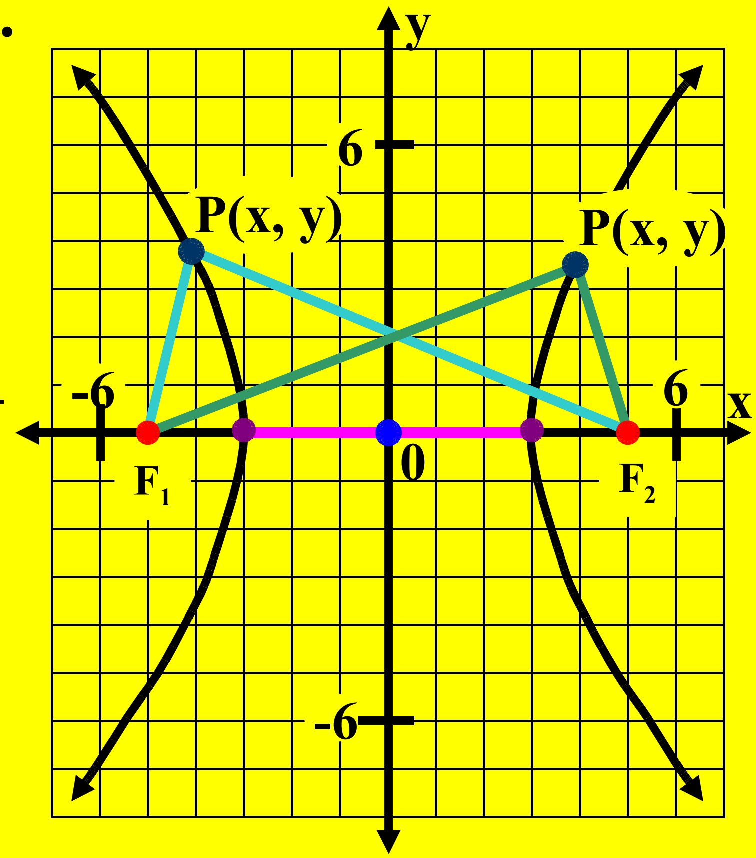

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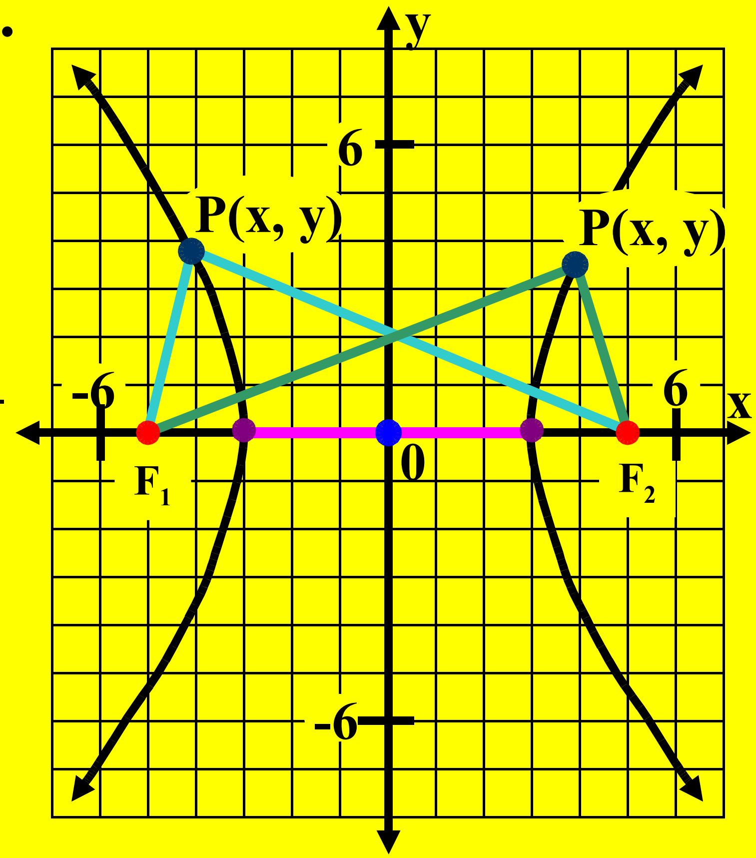

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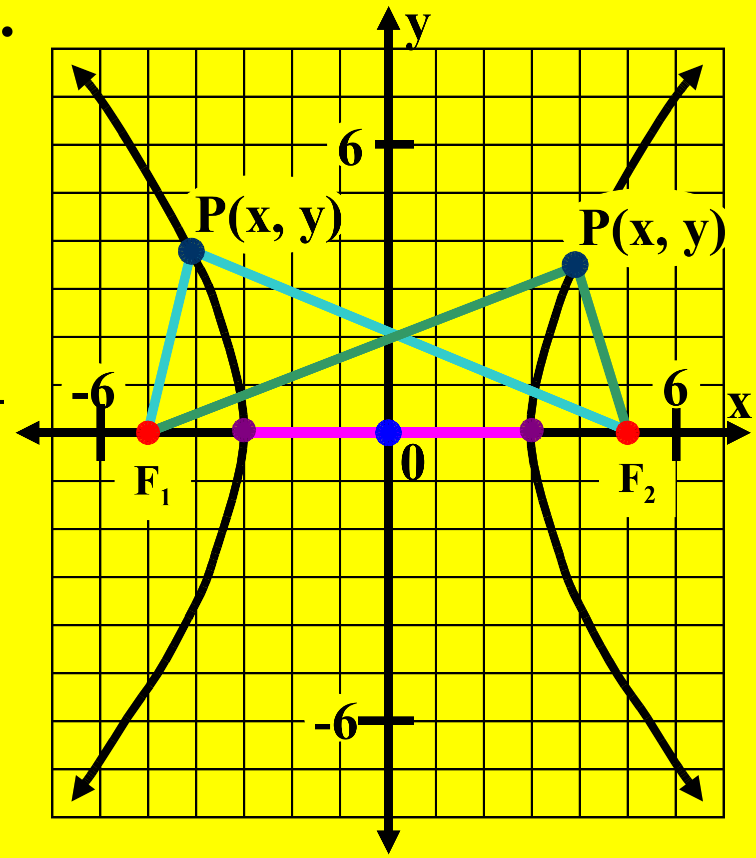

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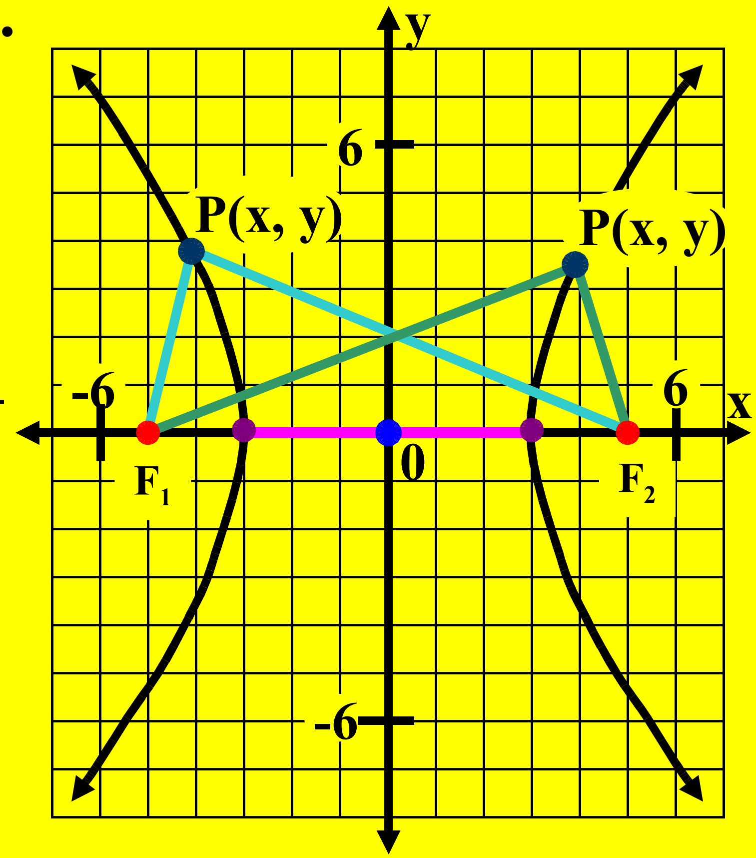

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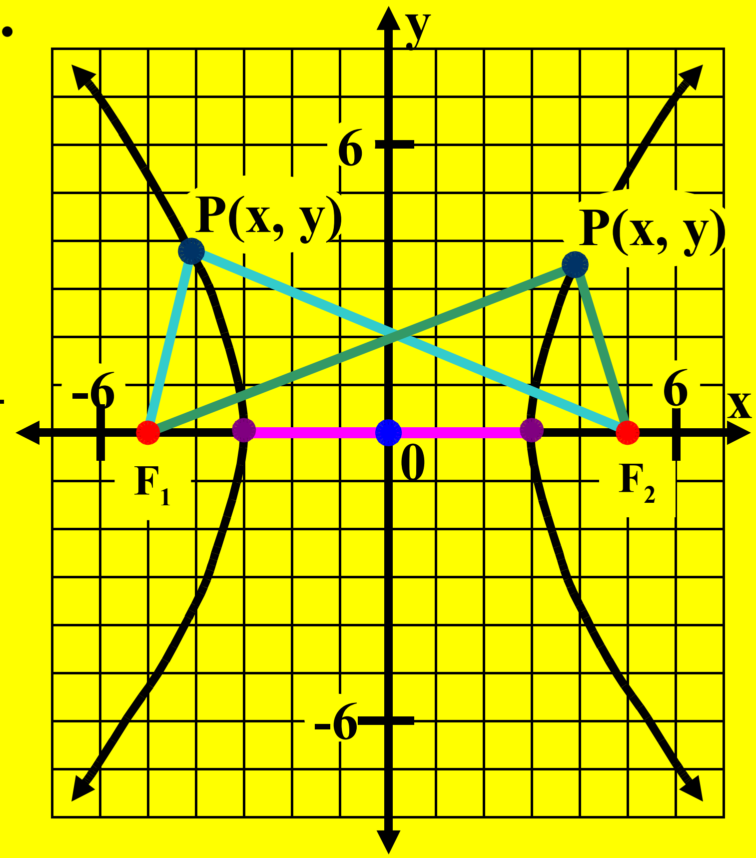

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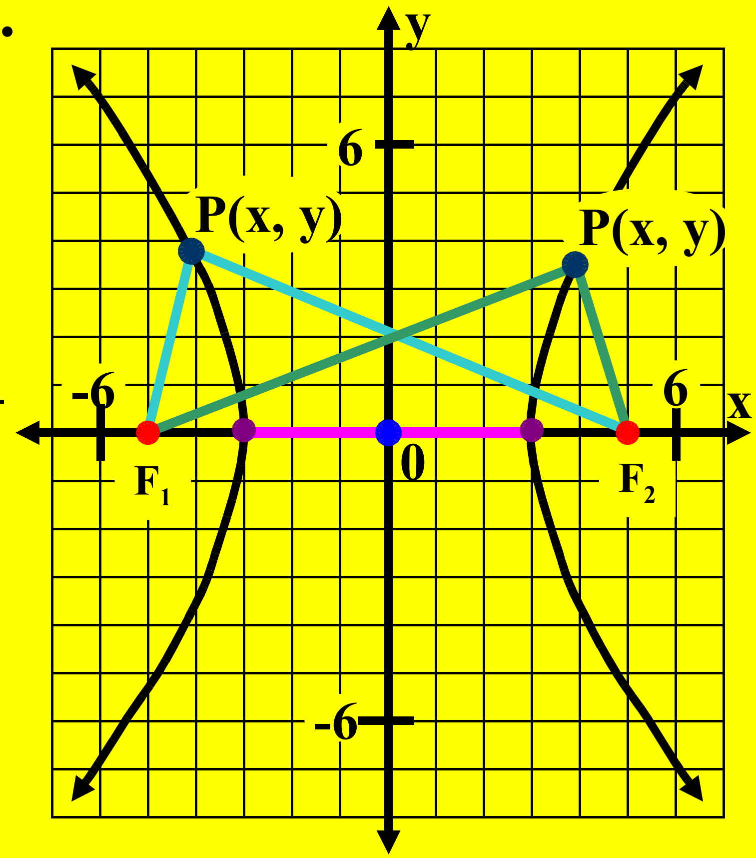

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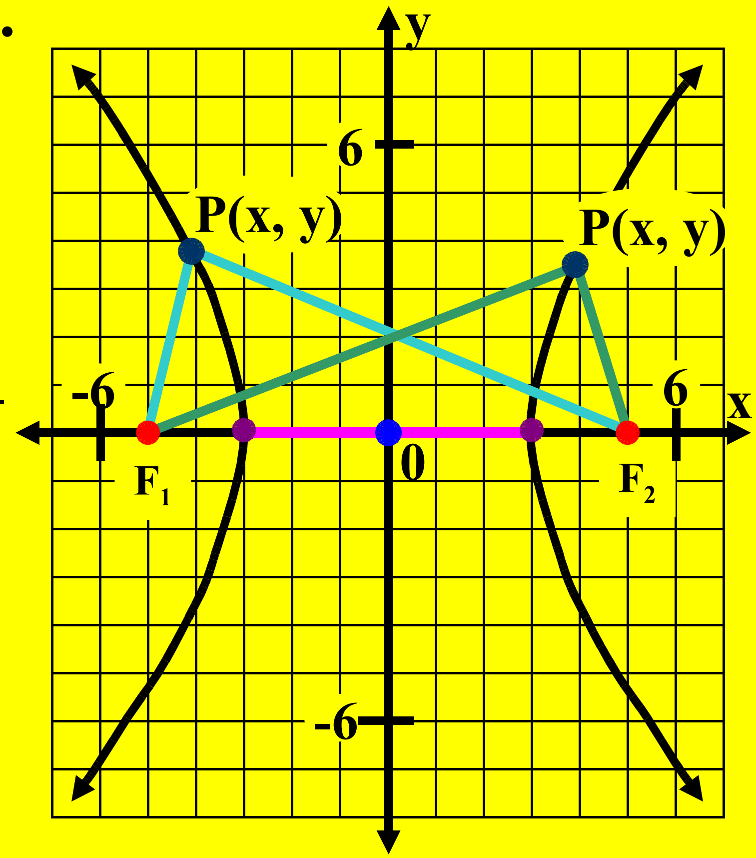

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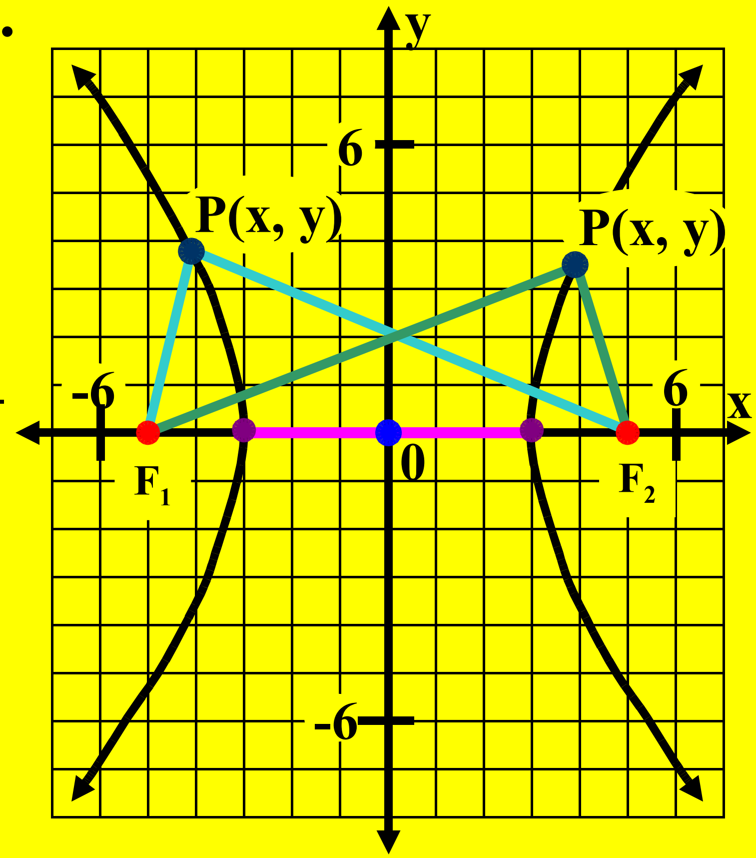

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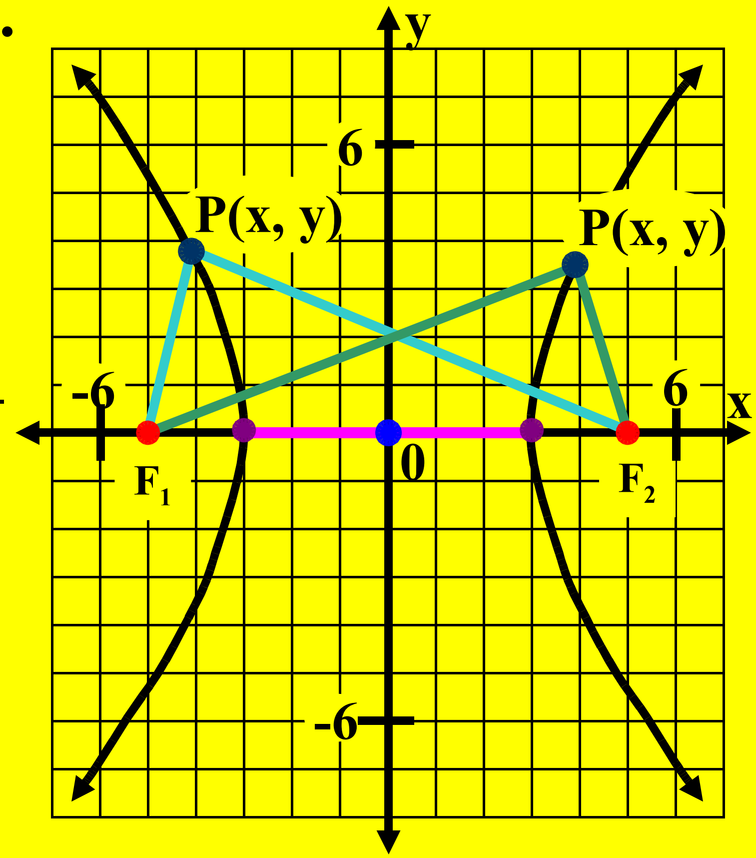

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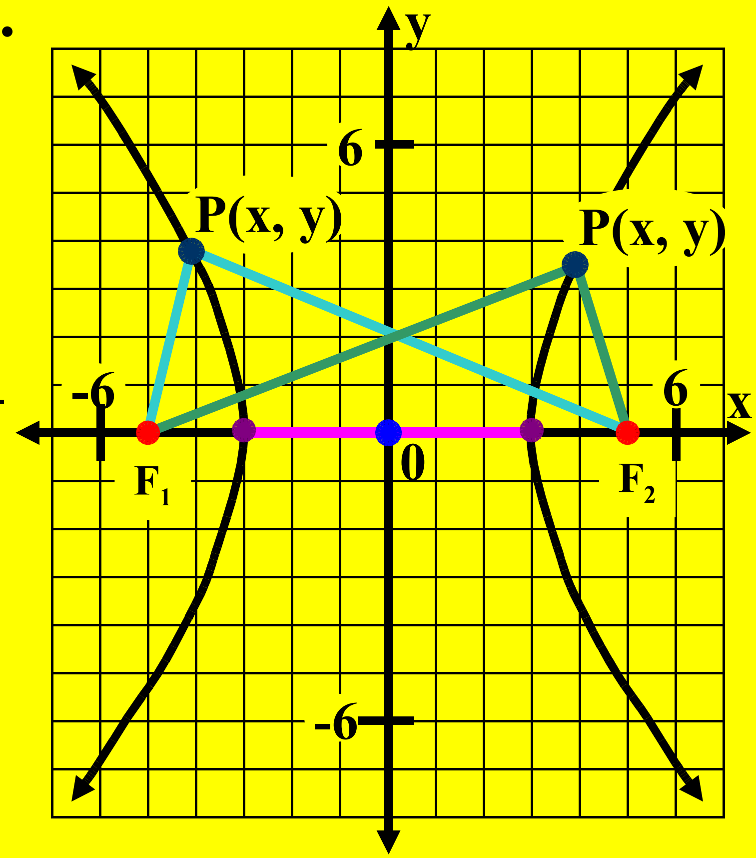
$$PF_2 = \sqrt{(x - 5)^2 + y^2}$$

The coordinates of F_1 are (-5, 0). If point P(x, y) represents any point on the hyperbola, then

$$PF_1 = \sqrt{(x - -5)^2 + (y - 0)^2} = \sqrt{(x + 5)^2 + y^2}$$

Given any two points in a plane, we want to consider all points in the plane such that the difference of their distances from the two given points is 6 units.

Next, we will add the coordinate axes to the diagram and derive an equation for this hyperbola.



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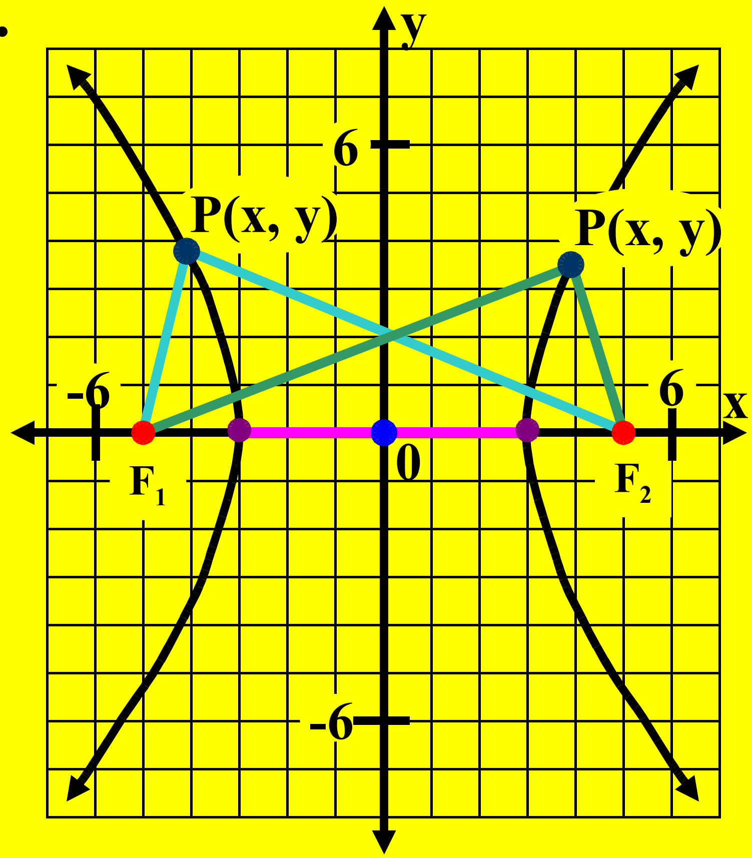

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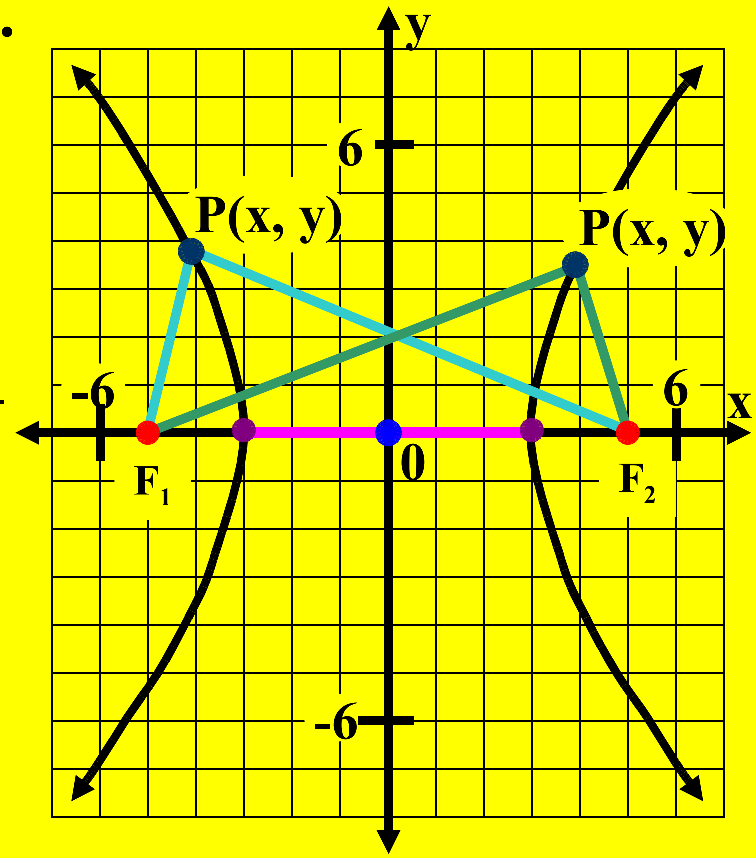

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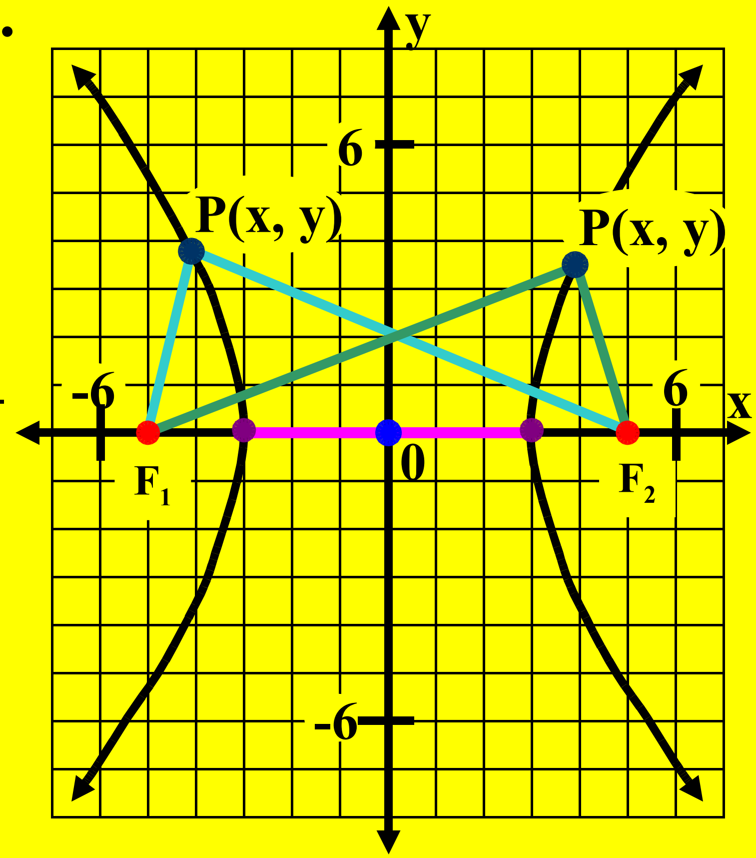

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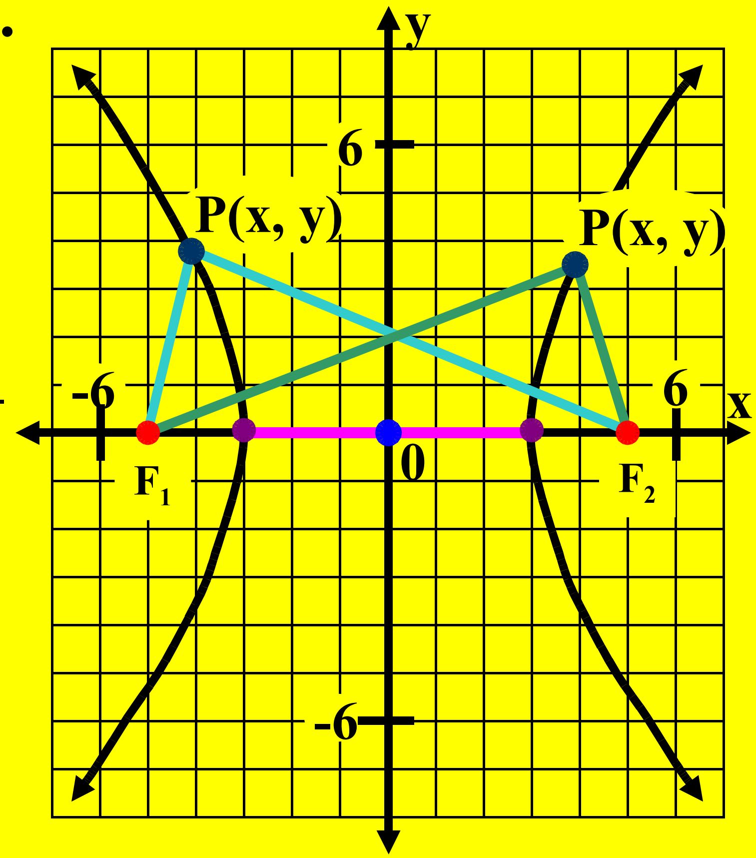

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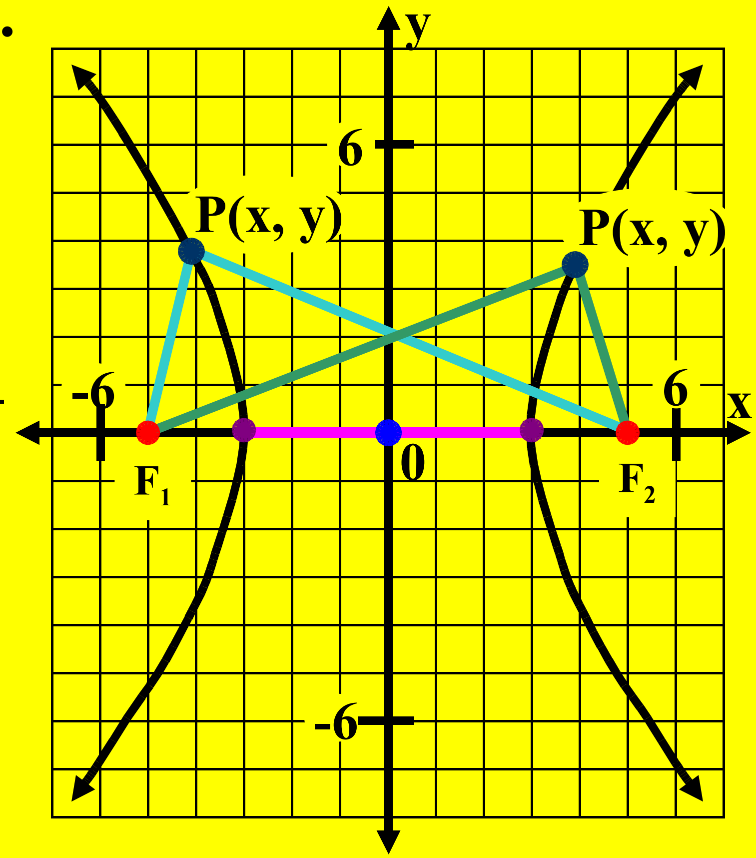

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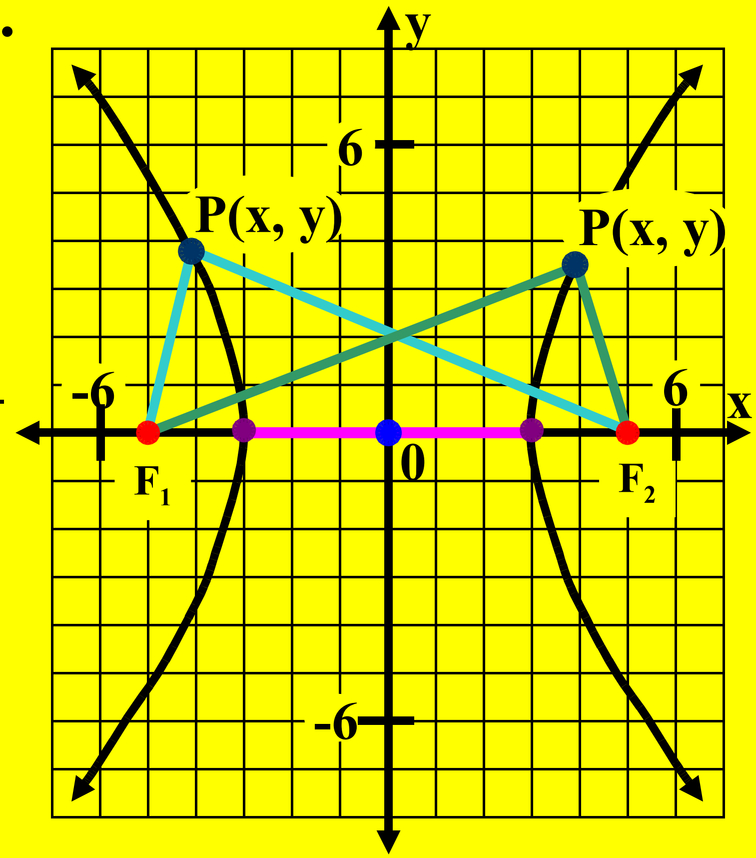

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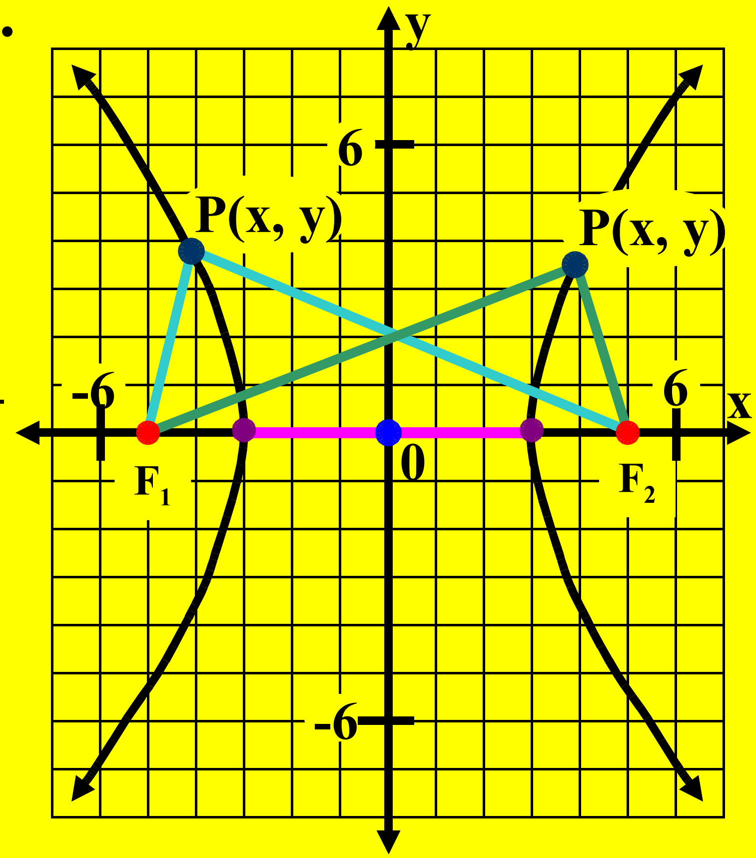

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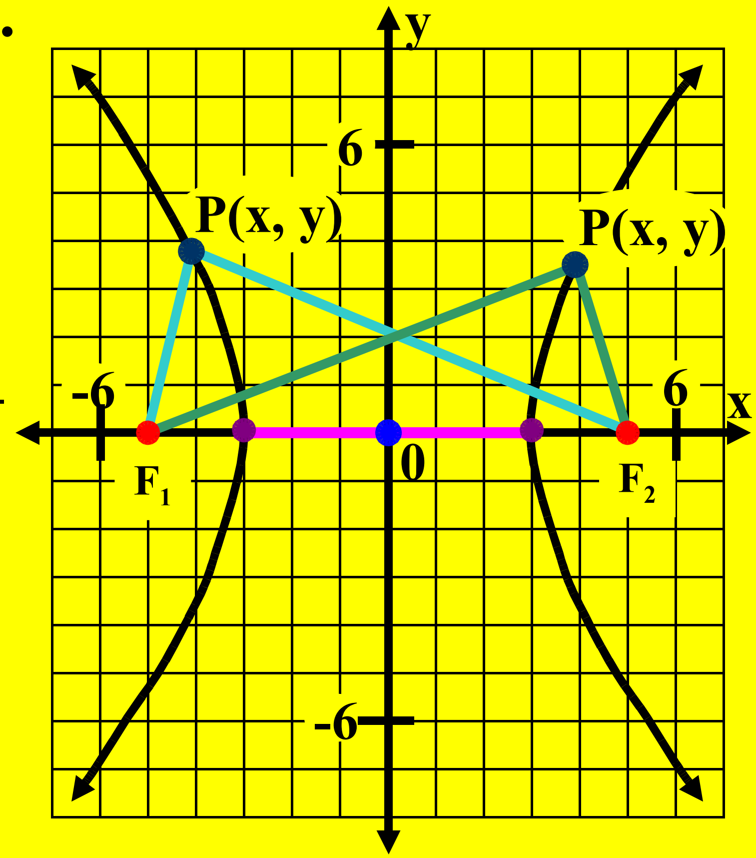

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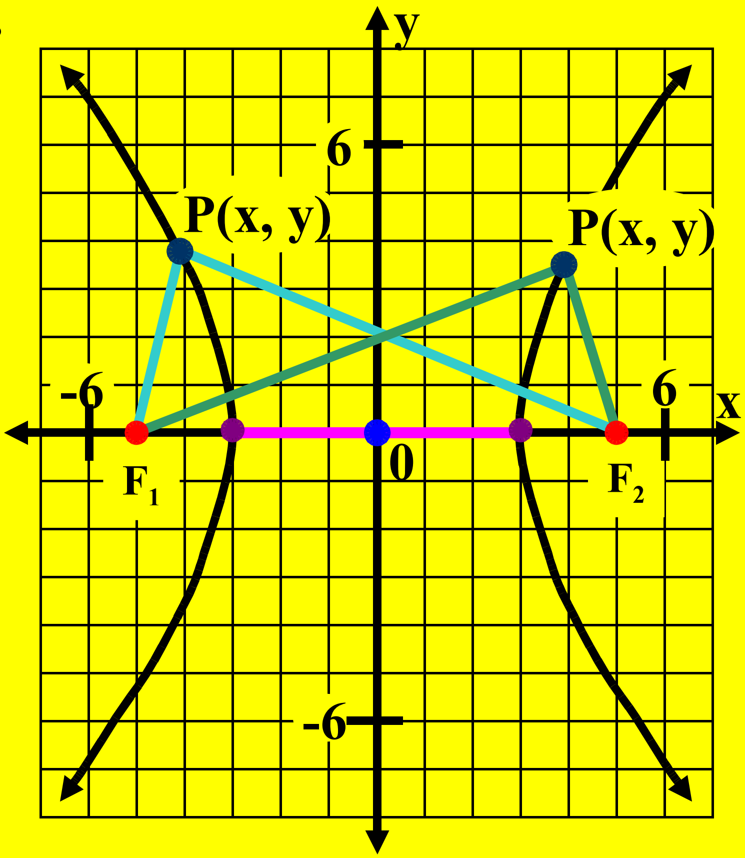

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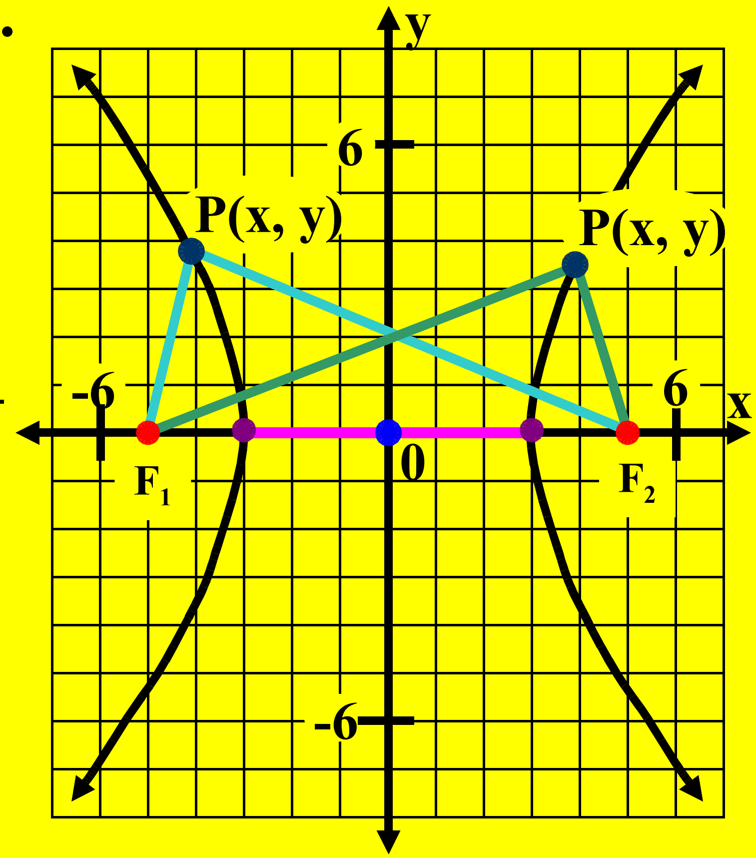

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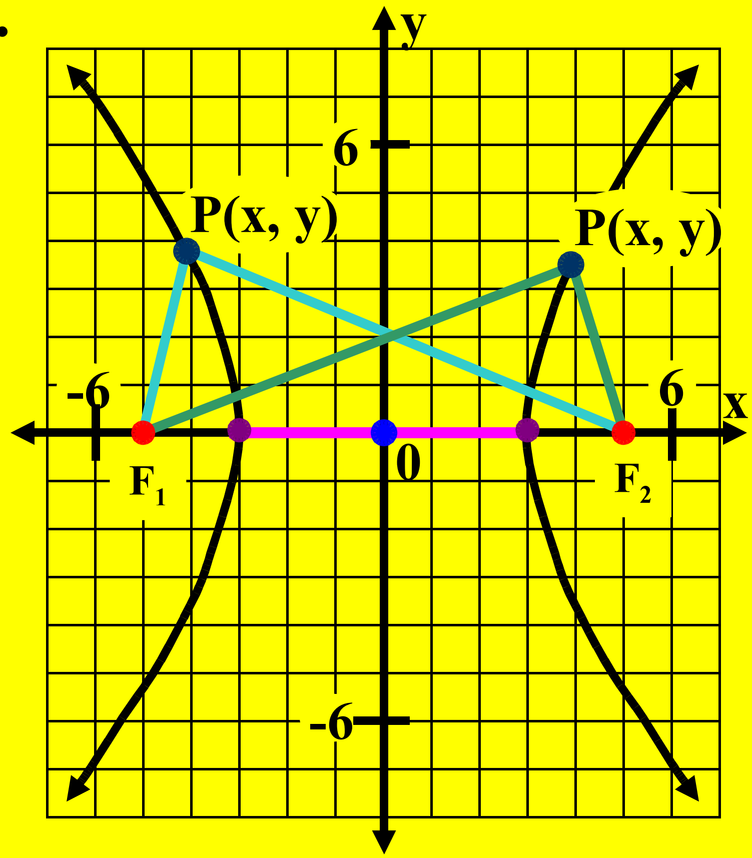

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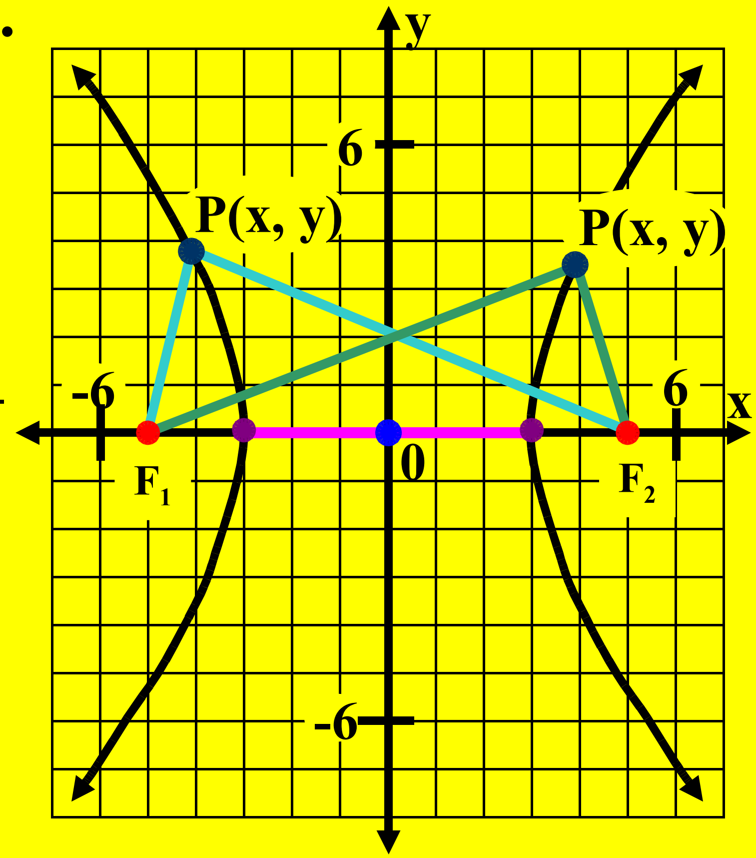

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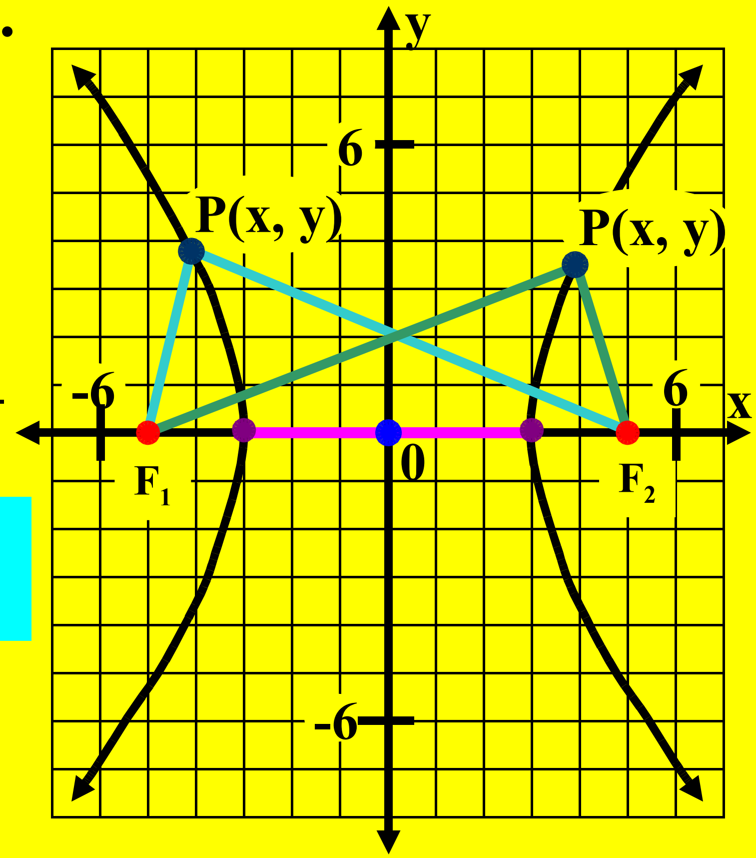

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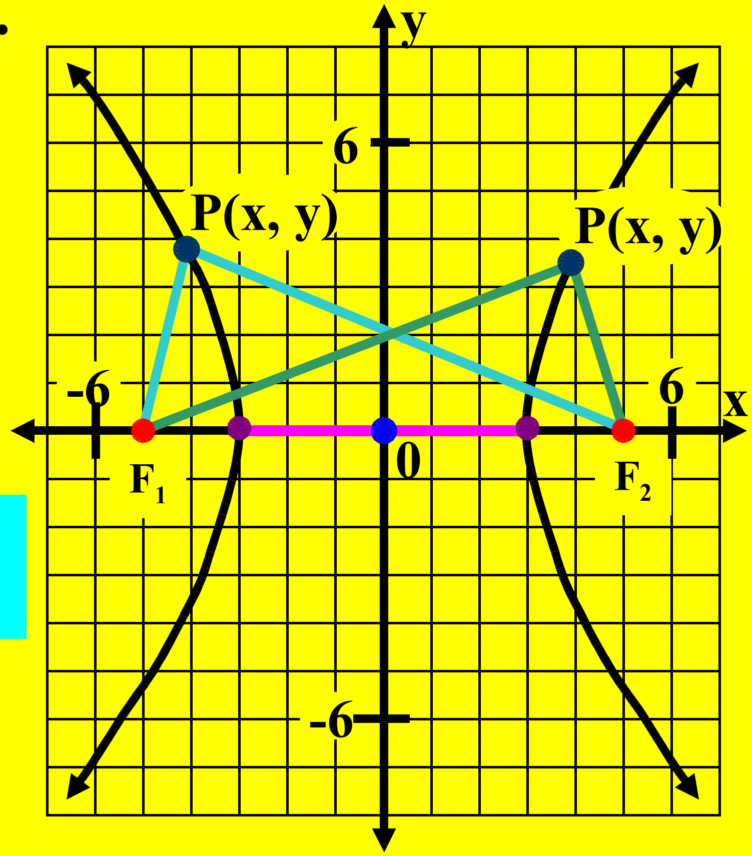

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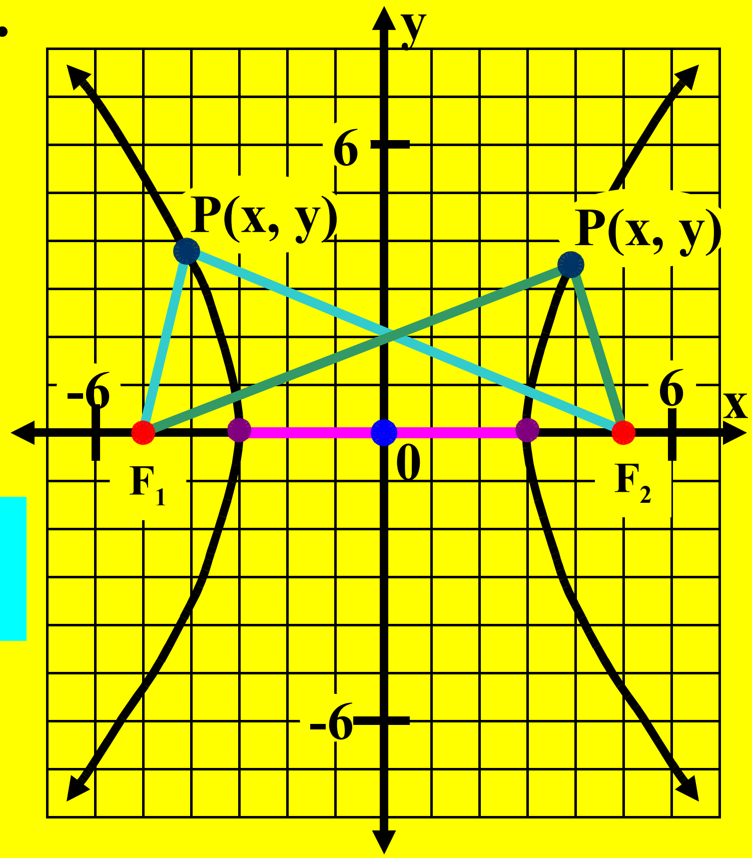

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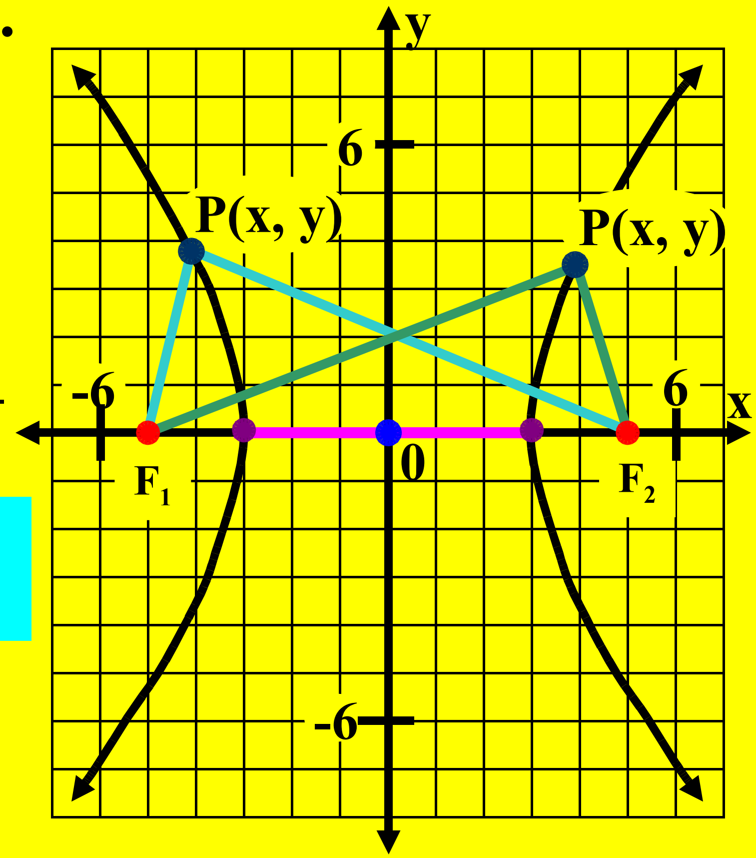

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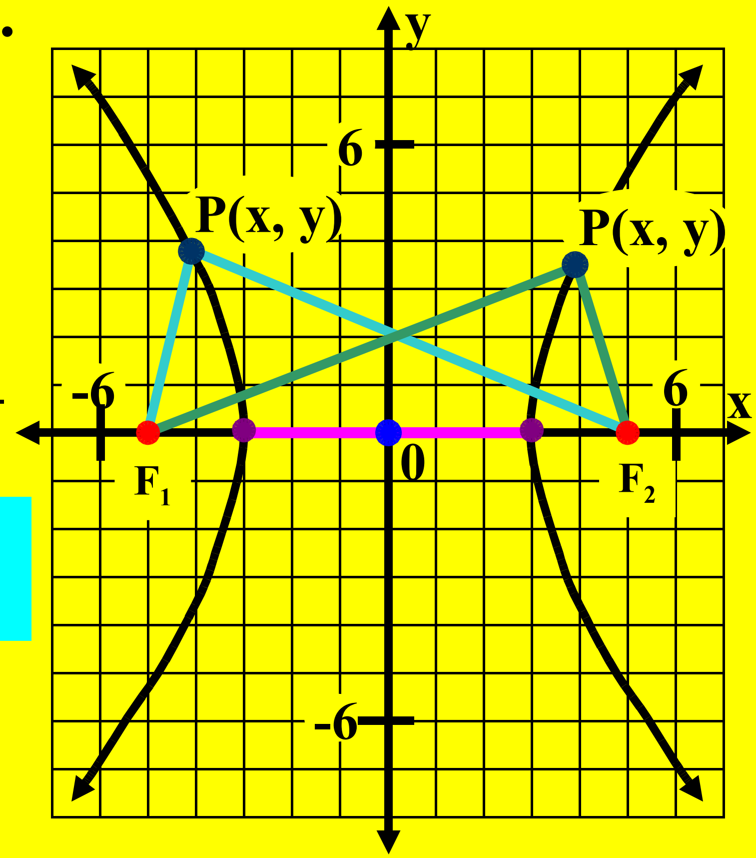

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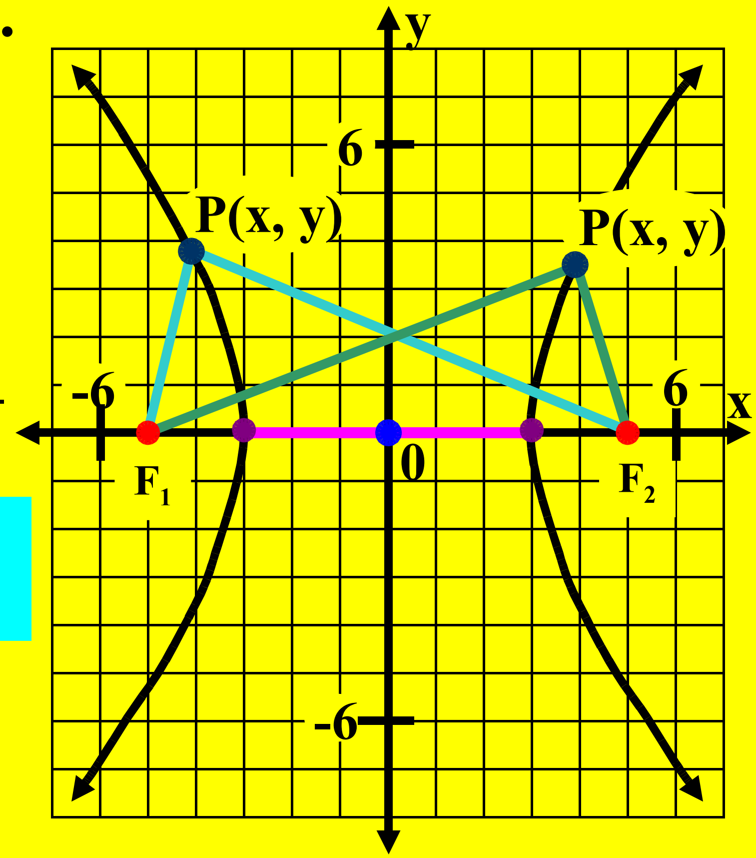

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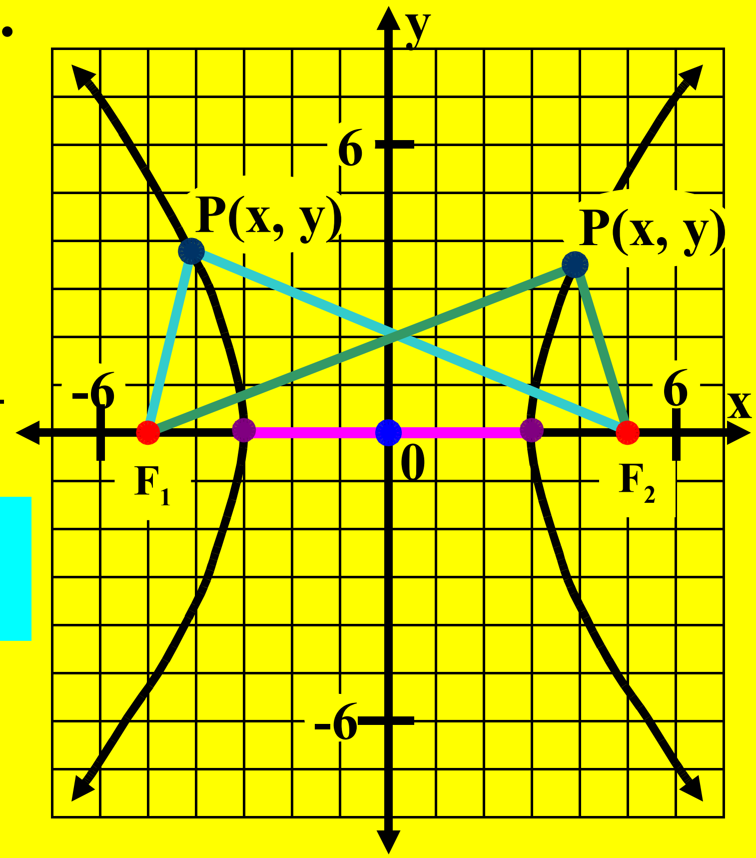

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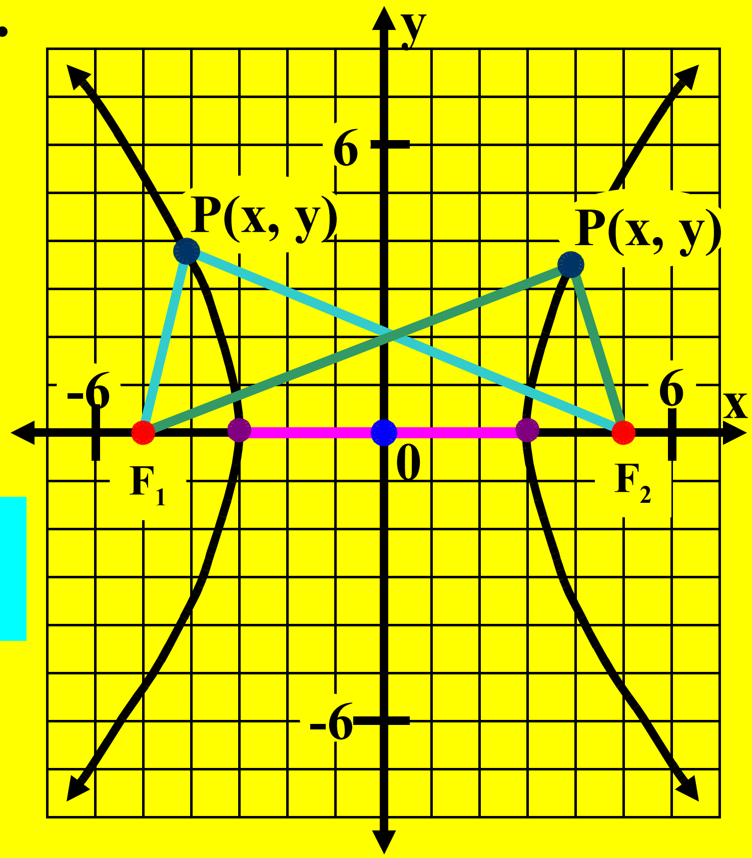

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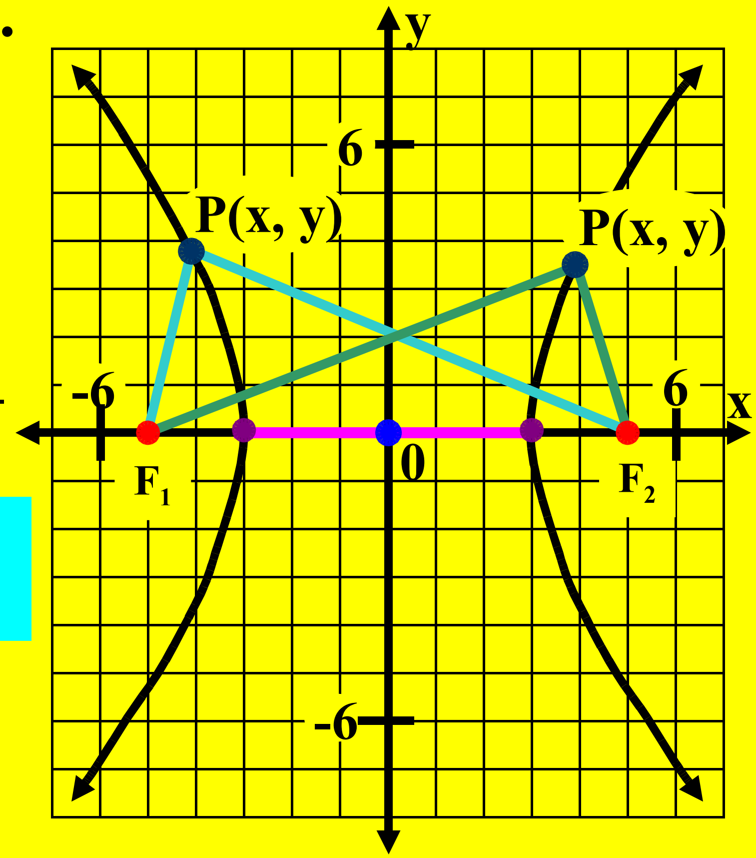

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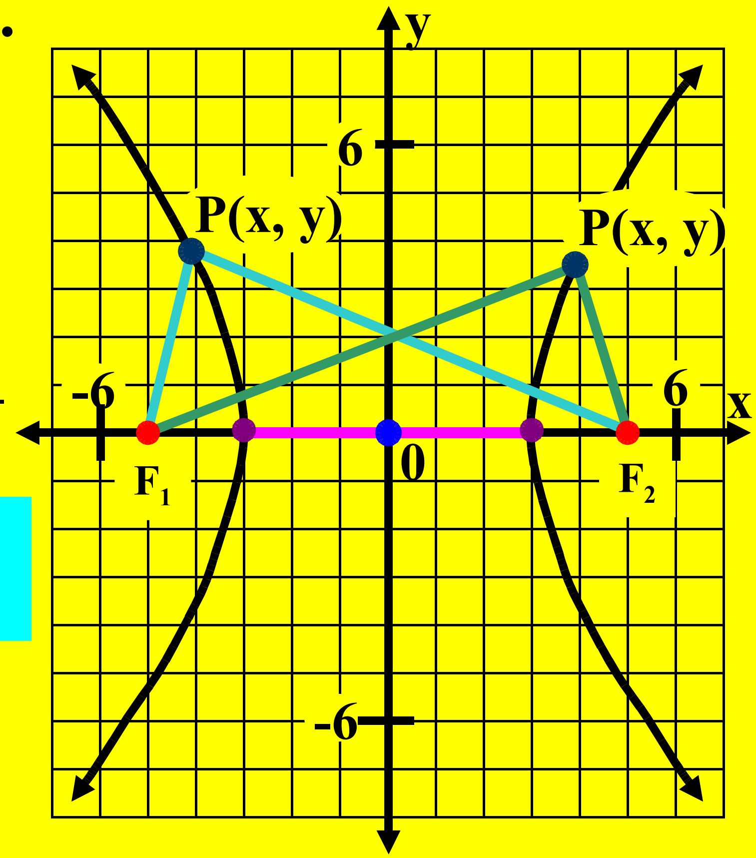

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Equations of a Hyperbola

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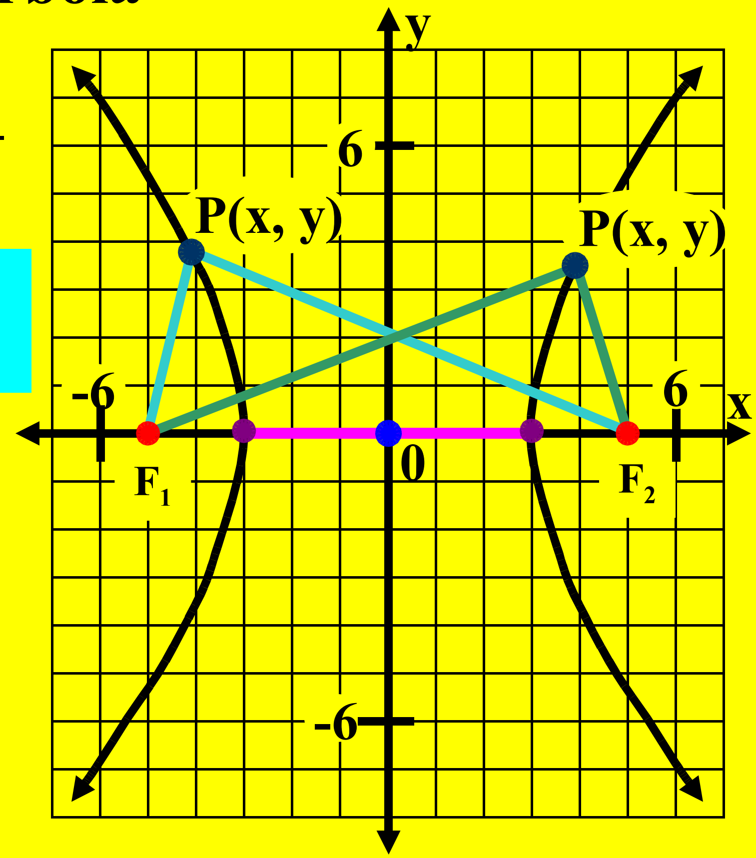

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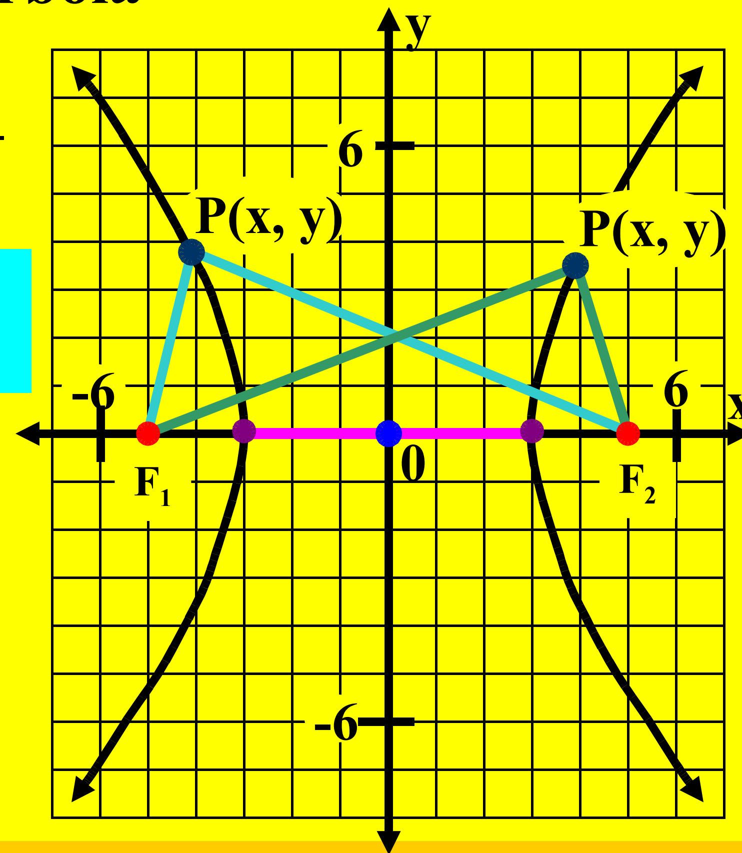

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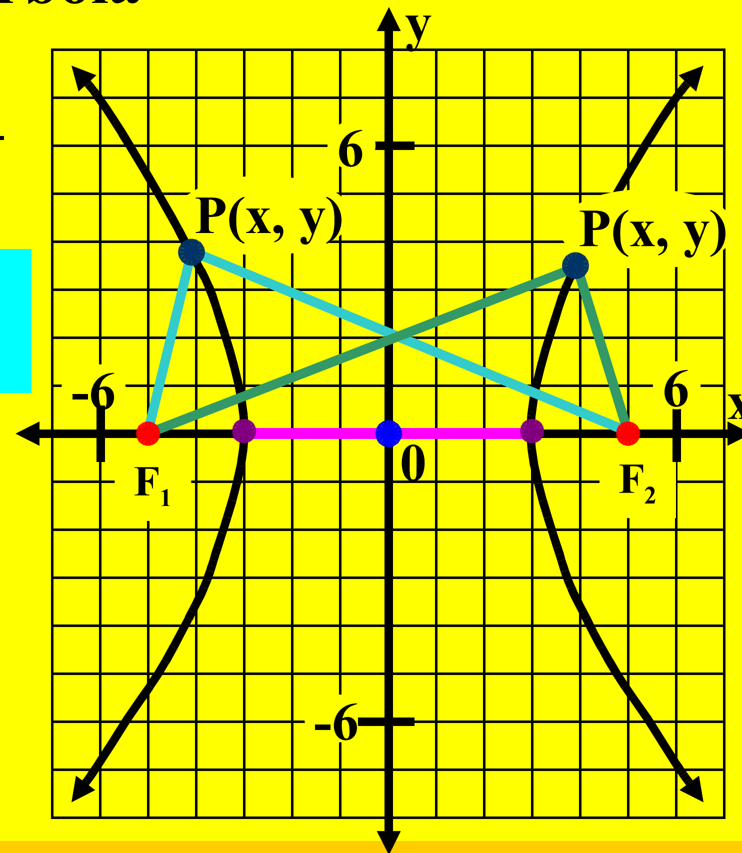

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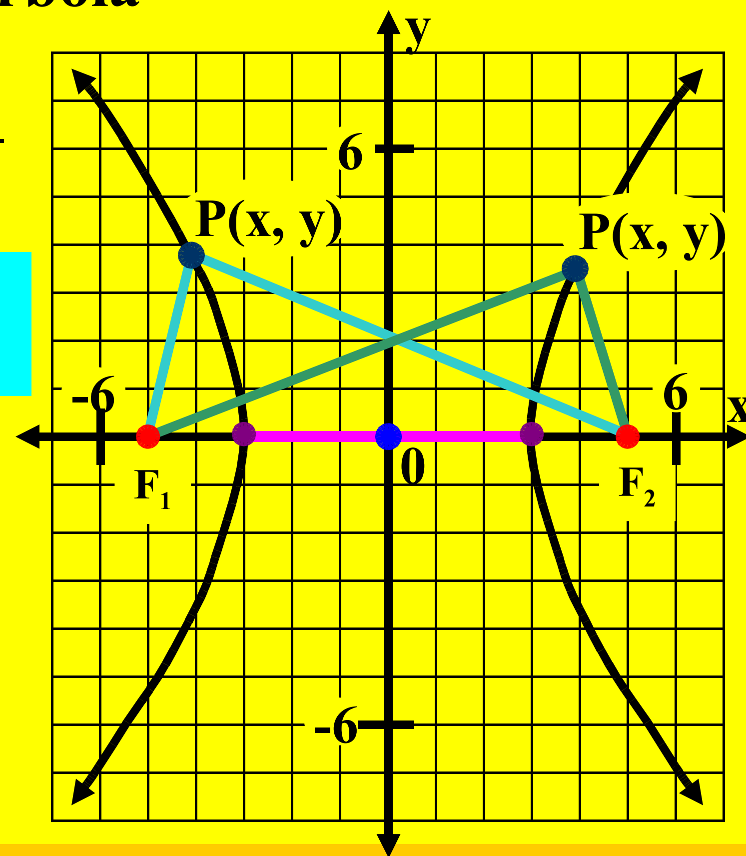

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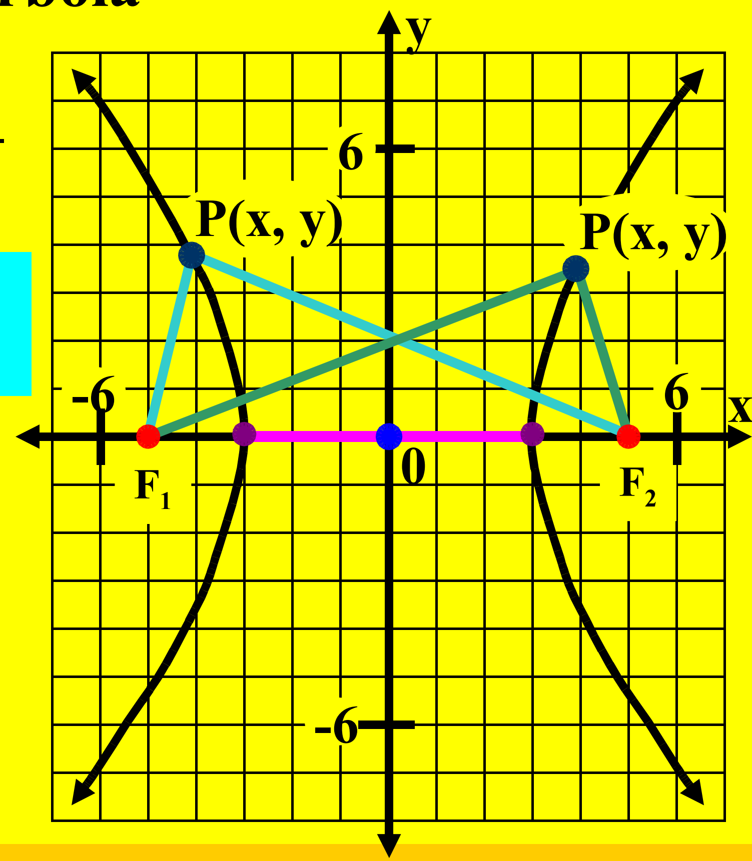

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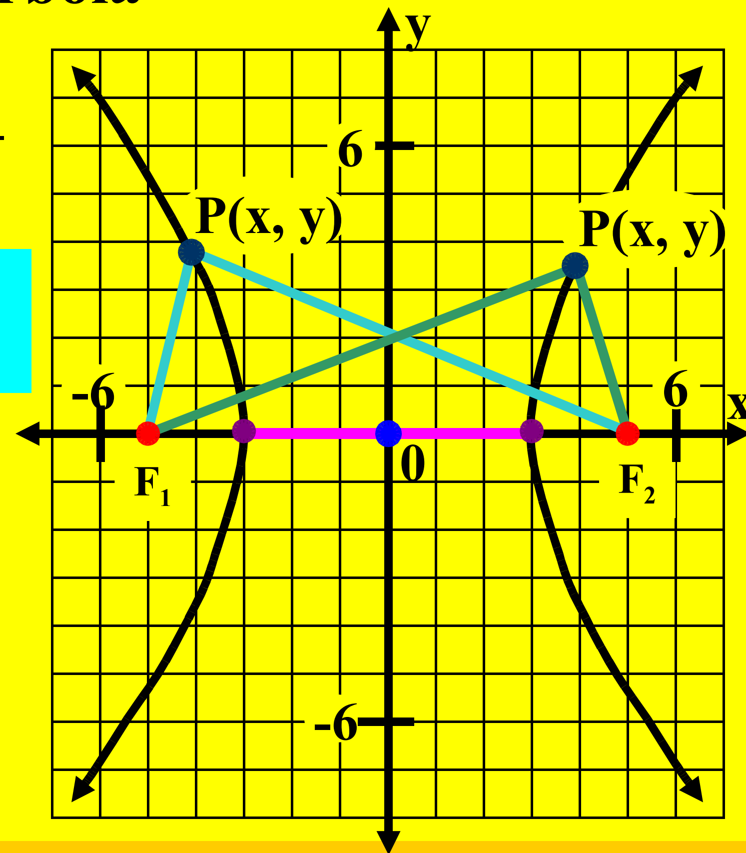

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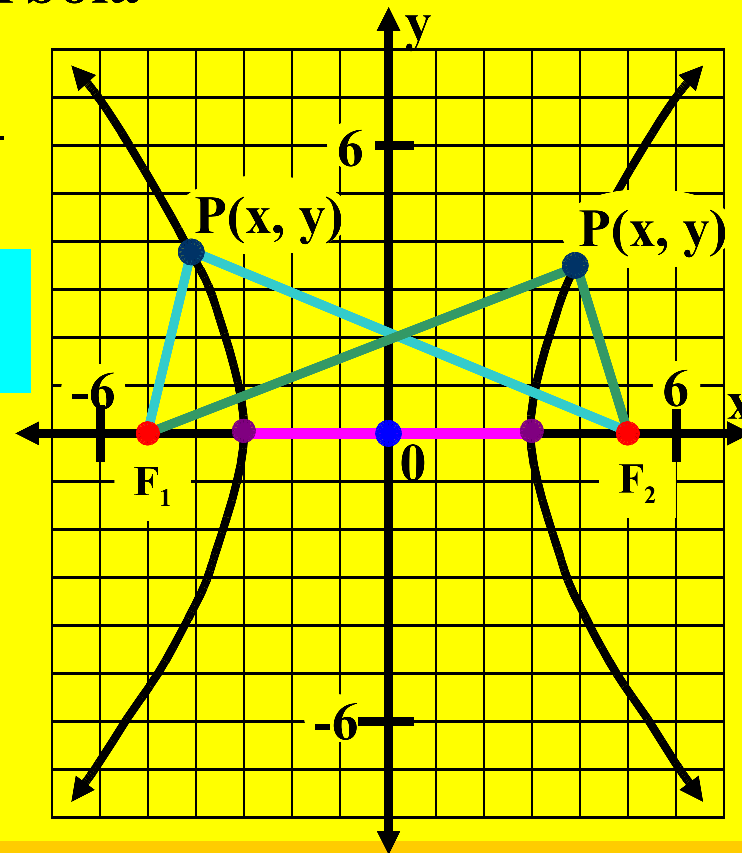

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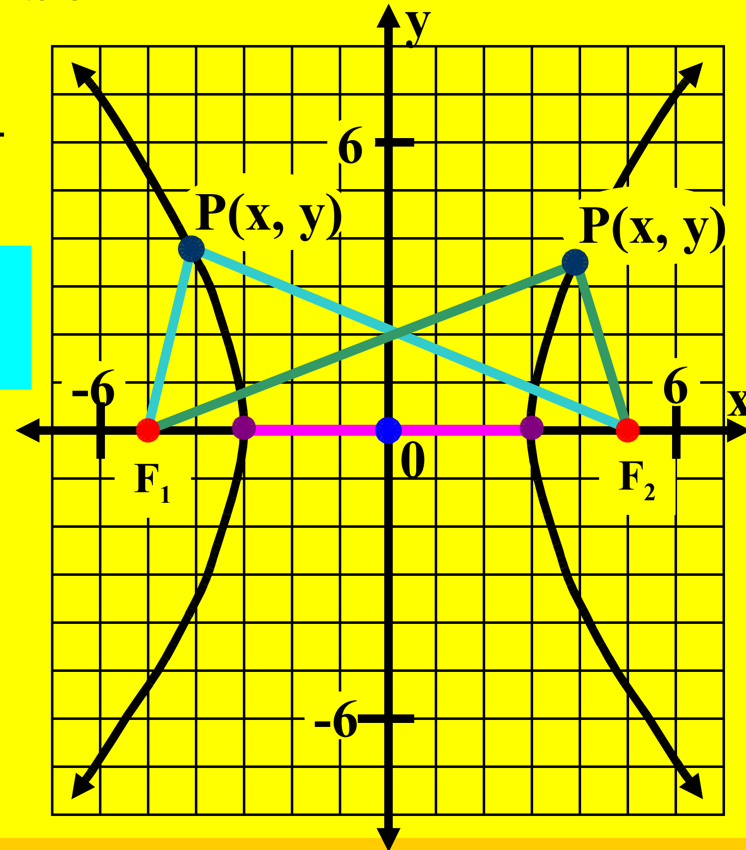

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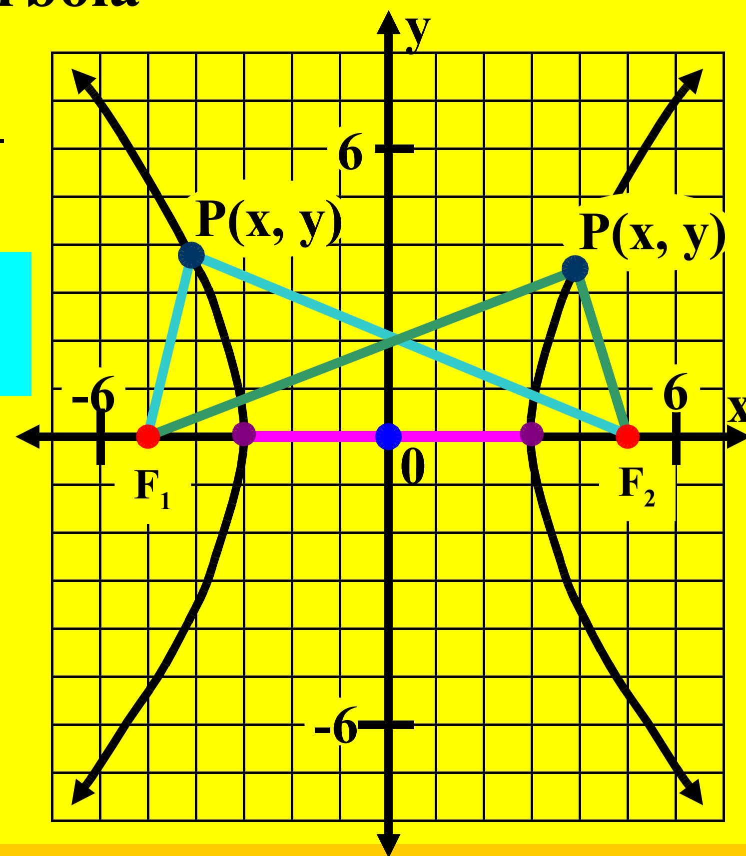

$$\sqrt{(x-5)^2 + y^2} - \sqrt{(x+5)^2 + y^2} = \pm 6$$

$$\sqrt{(x-5)^2 + y^2} = \sqrt{(x+5)^2 + y^2} \pm 6$$

Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

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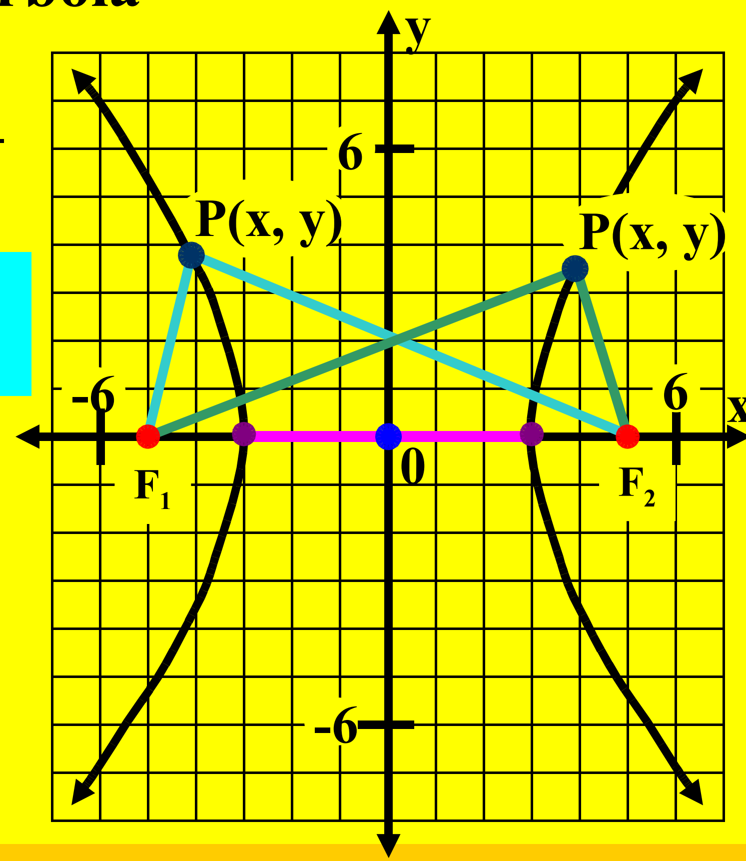

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Equations of a Hyperbola

If P(x, y) represents <u>any point on the</u> <u>hyperbola</u>, then

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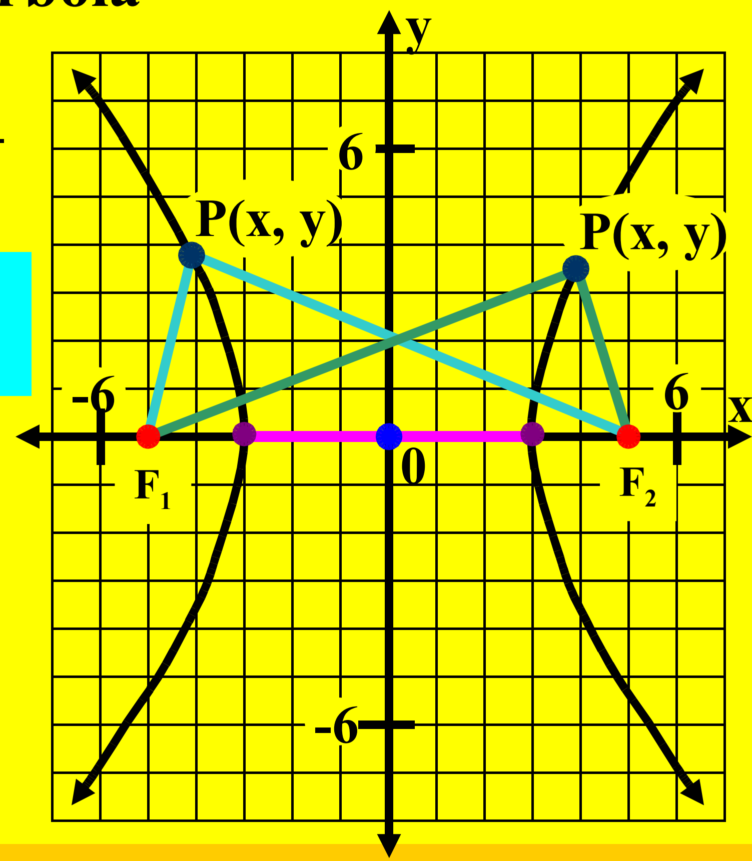

This equation is equivalent to

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$$\sqrt{(x-5)^2+y^2} = \sqrt{(x+5)^2+y^2} \pm 6$$

Square both sides.

Equations of a Hyperbola

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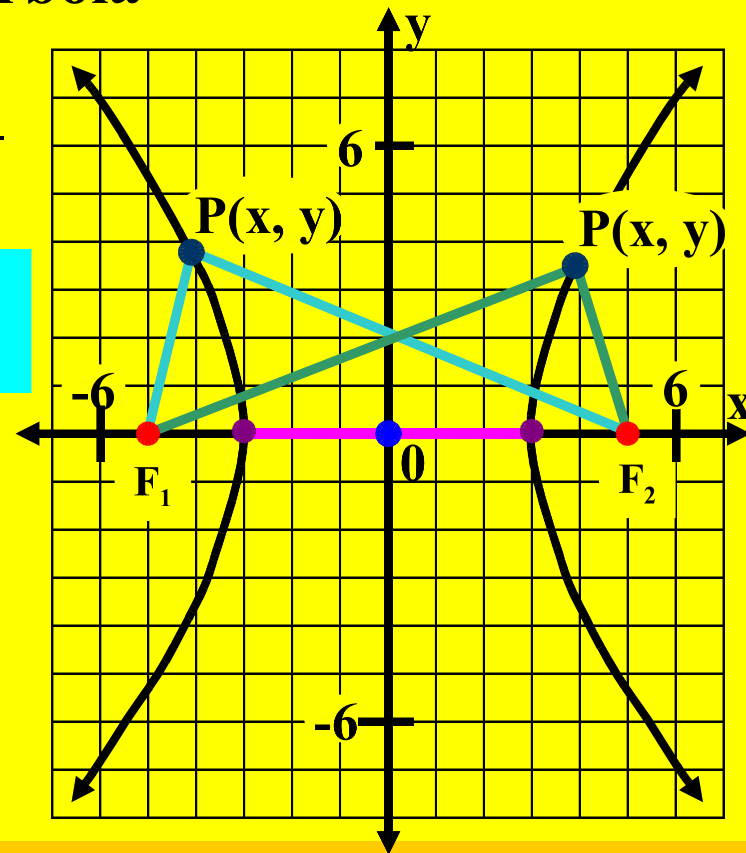

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Square both sides.

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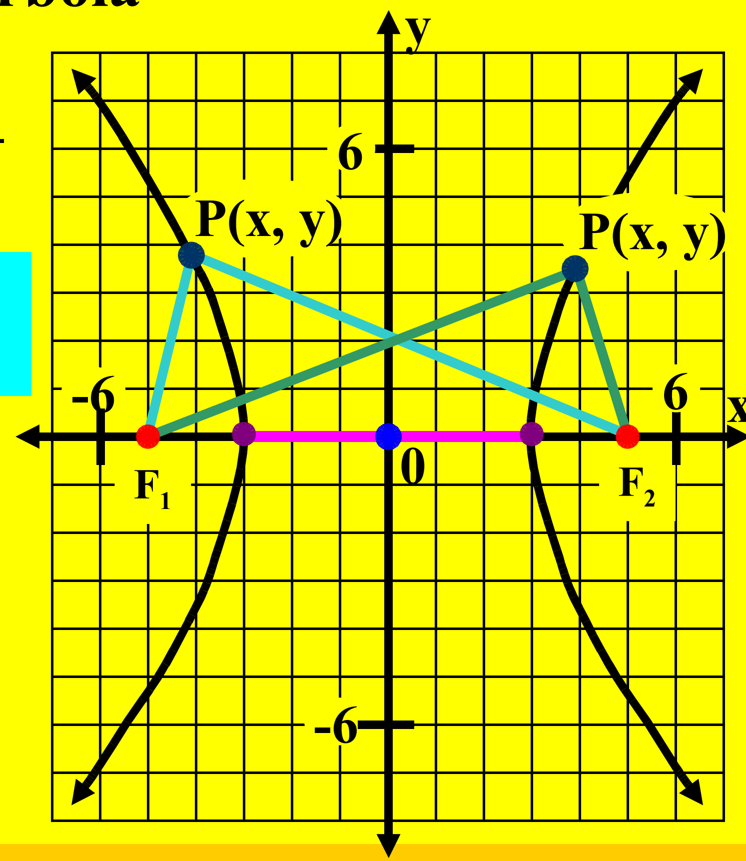

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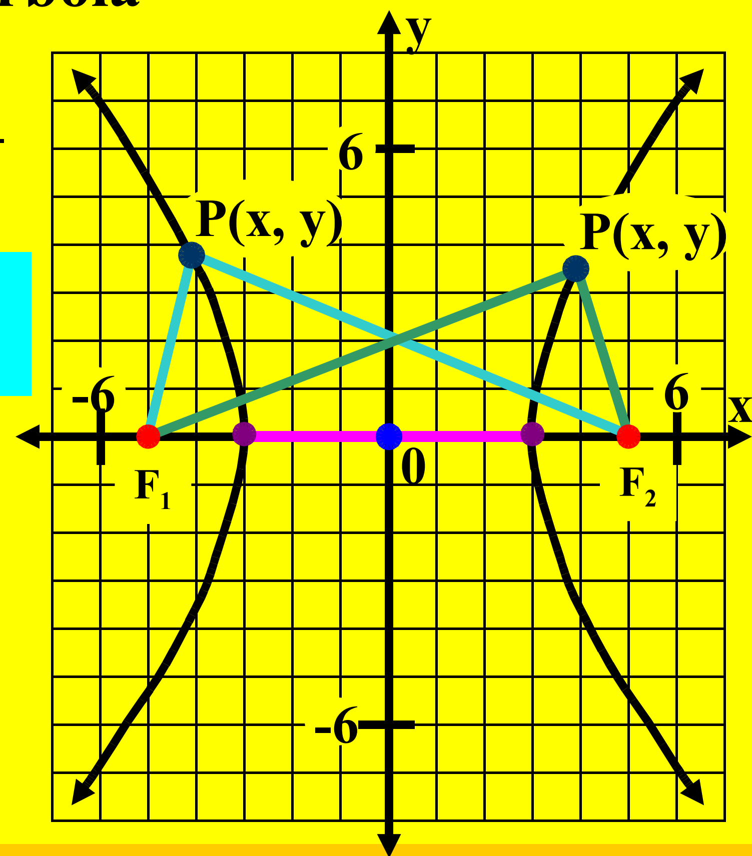

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Square both sides.

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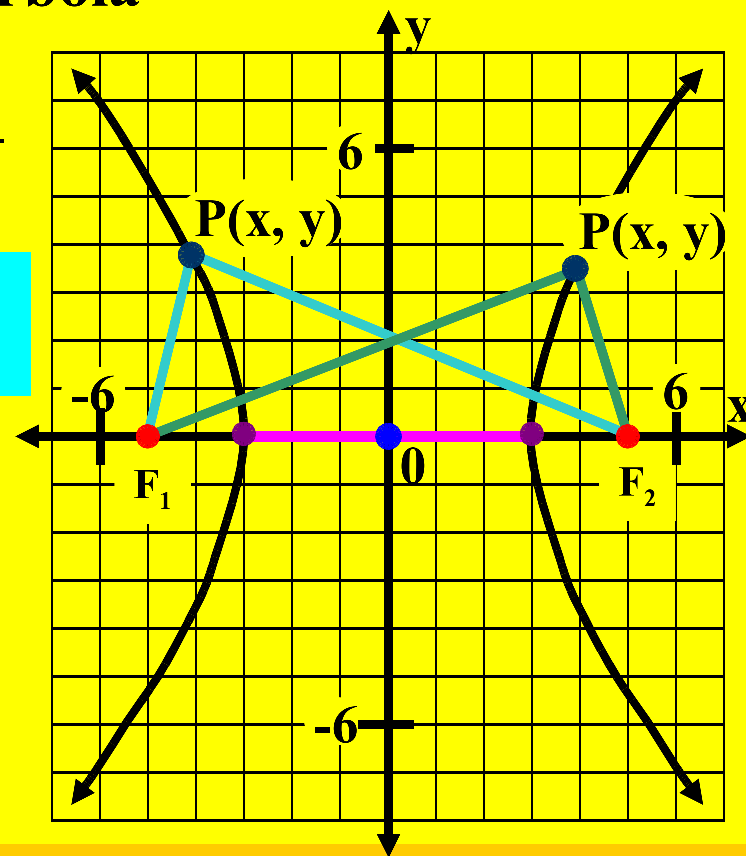

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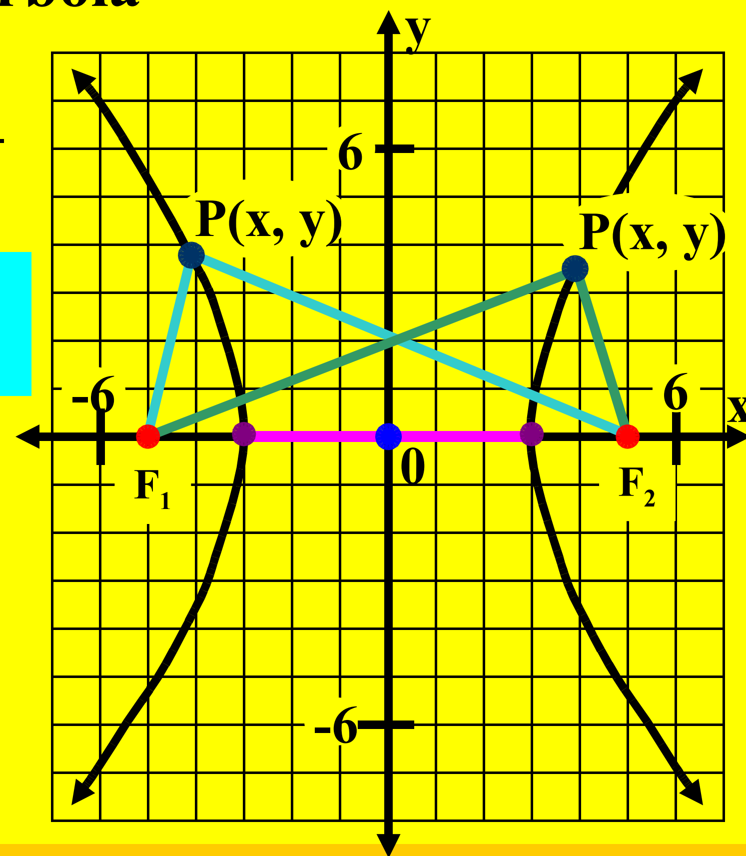

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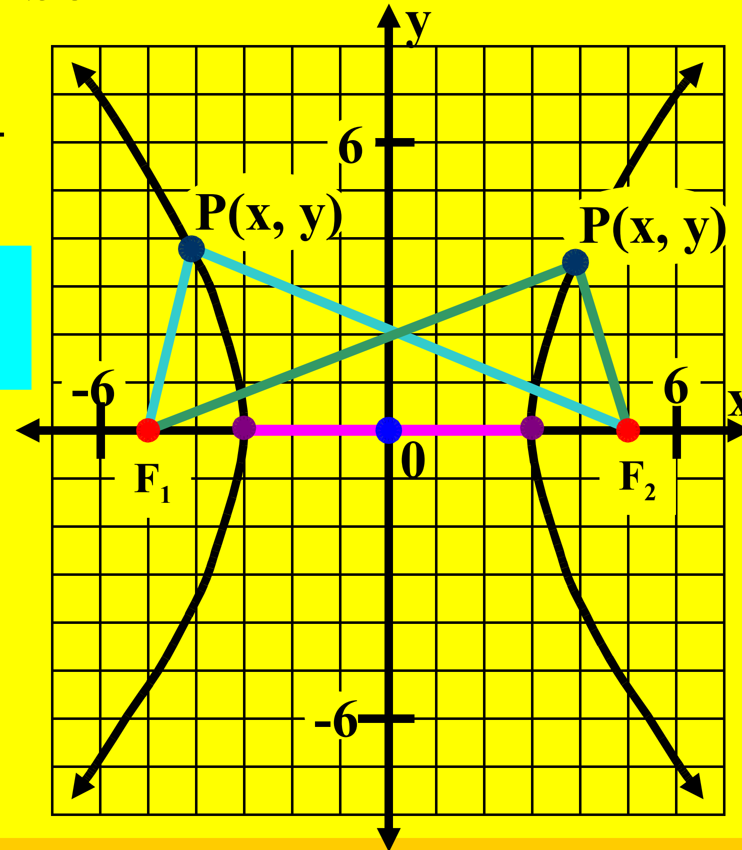

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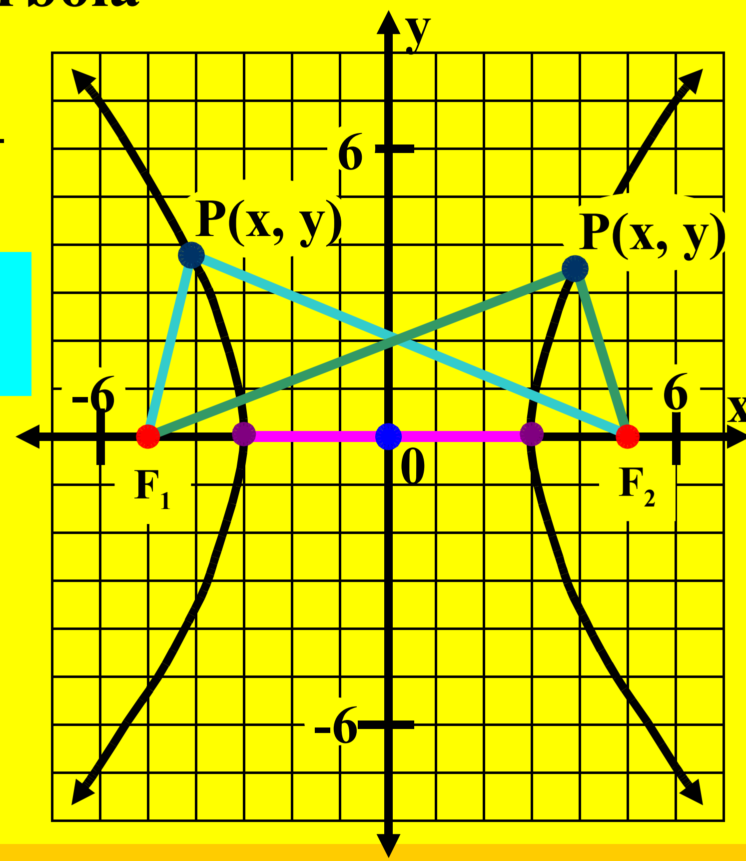

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$$(x-5)^2 + \boxed{y^2} = (x+5)^2 + \boxed{y^2} \pm 12\sqrt{(x+5)^2+y^2} + 36$$

Subtract y^2 from both sides.

Equations of a Hyperbola

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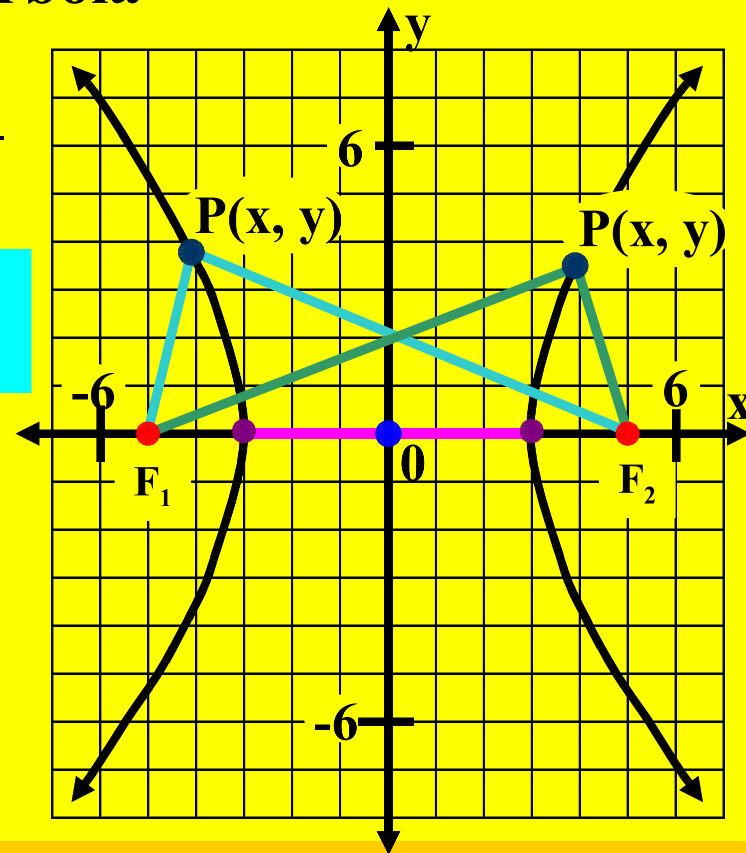

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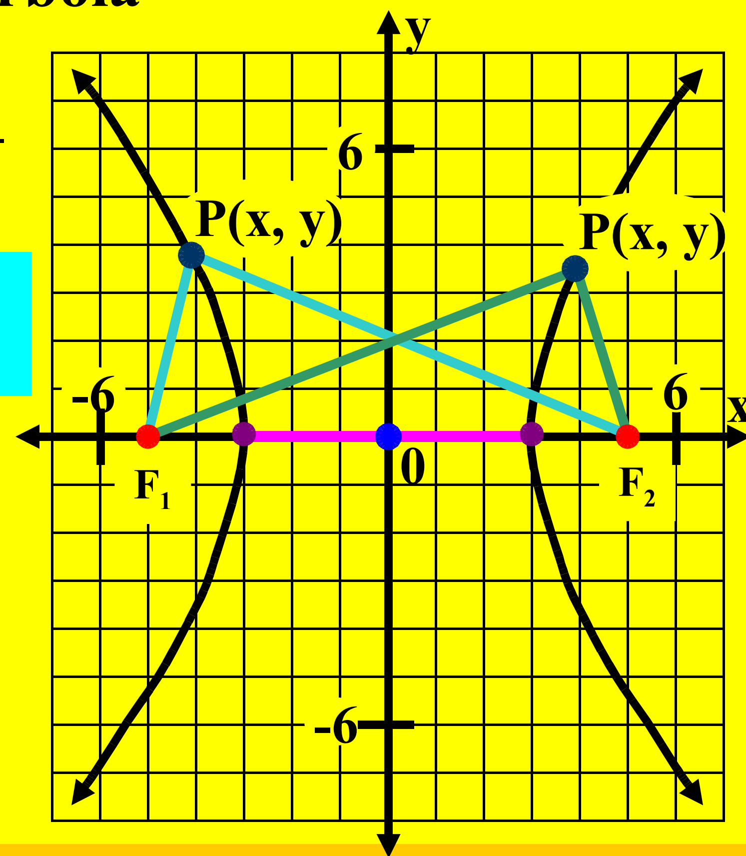

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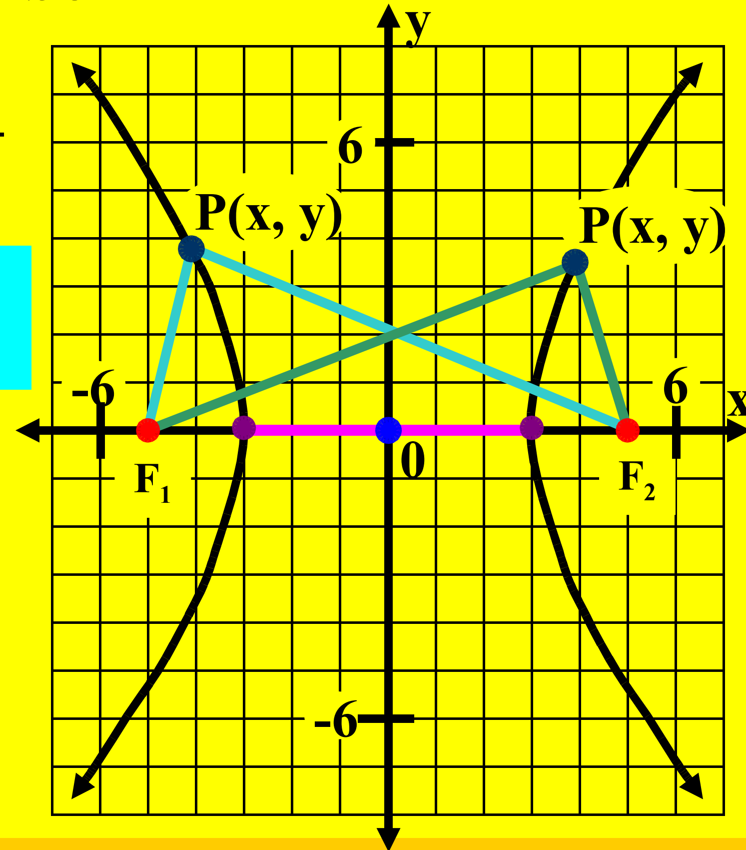

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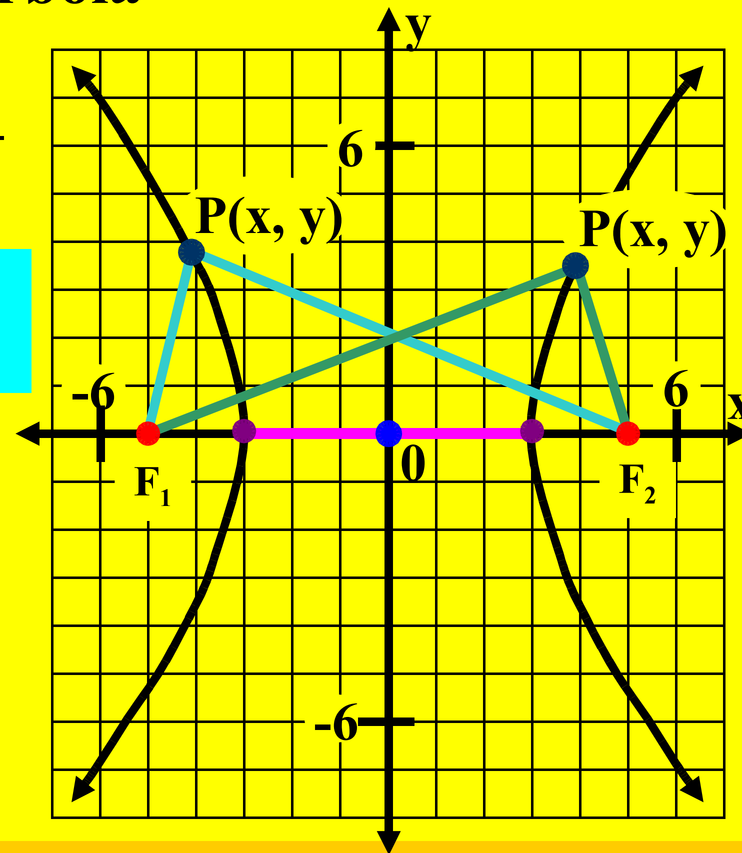

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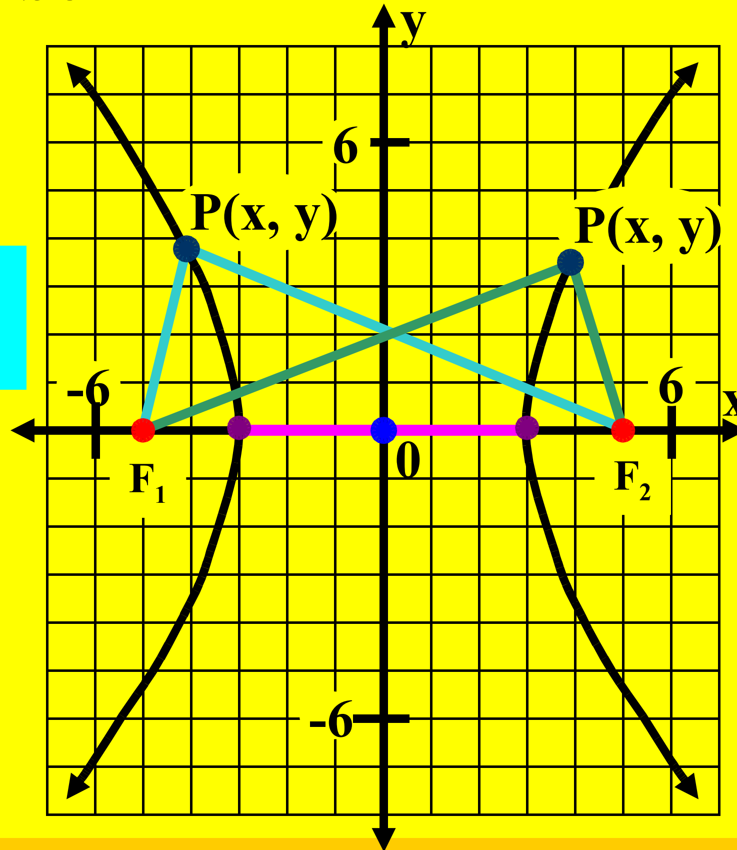

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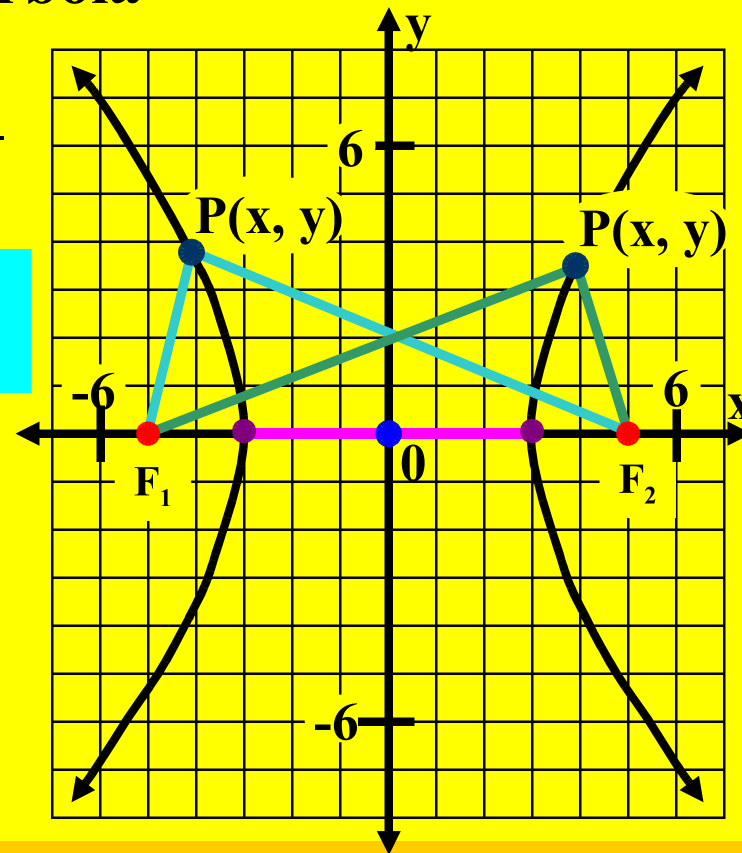

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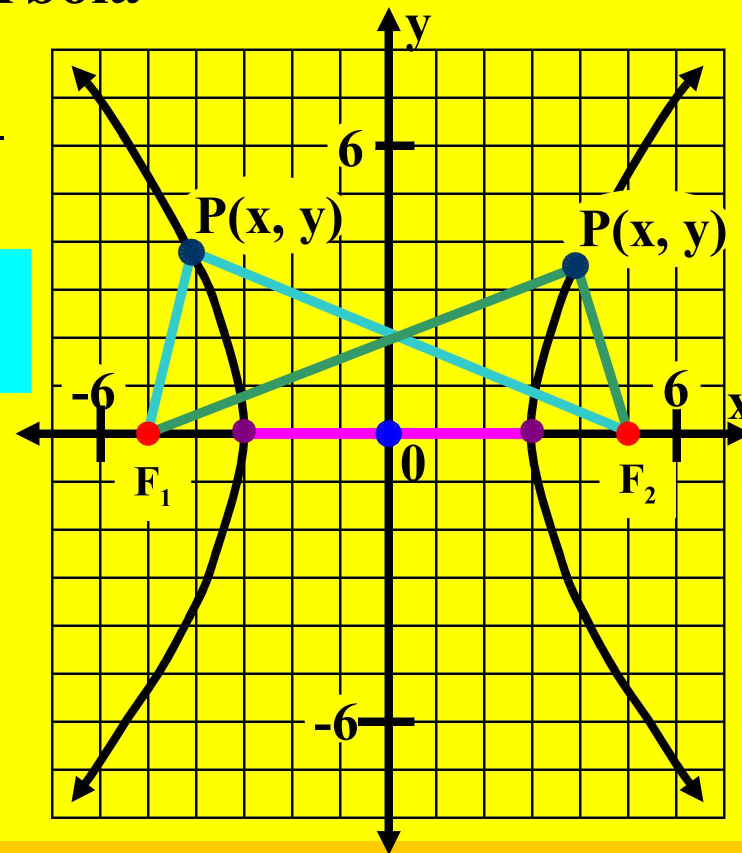

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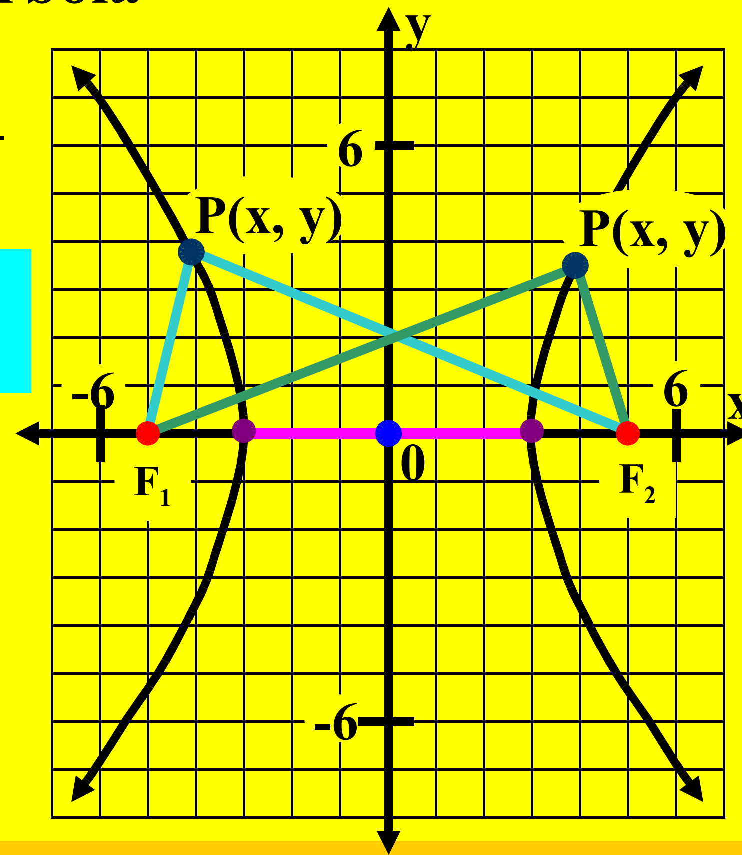

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Square the binomials.

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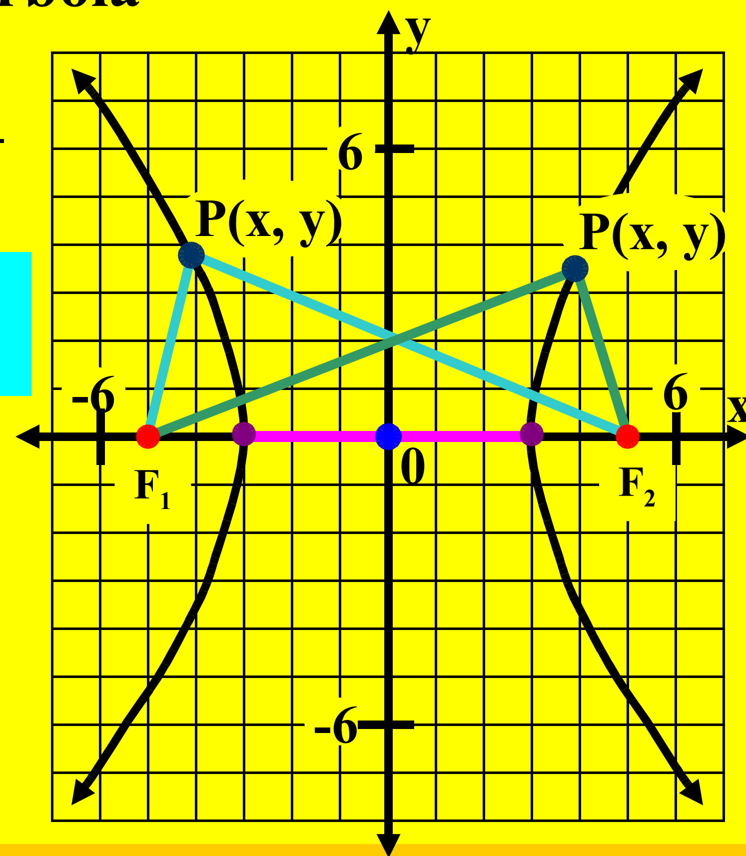

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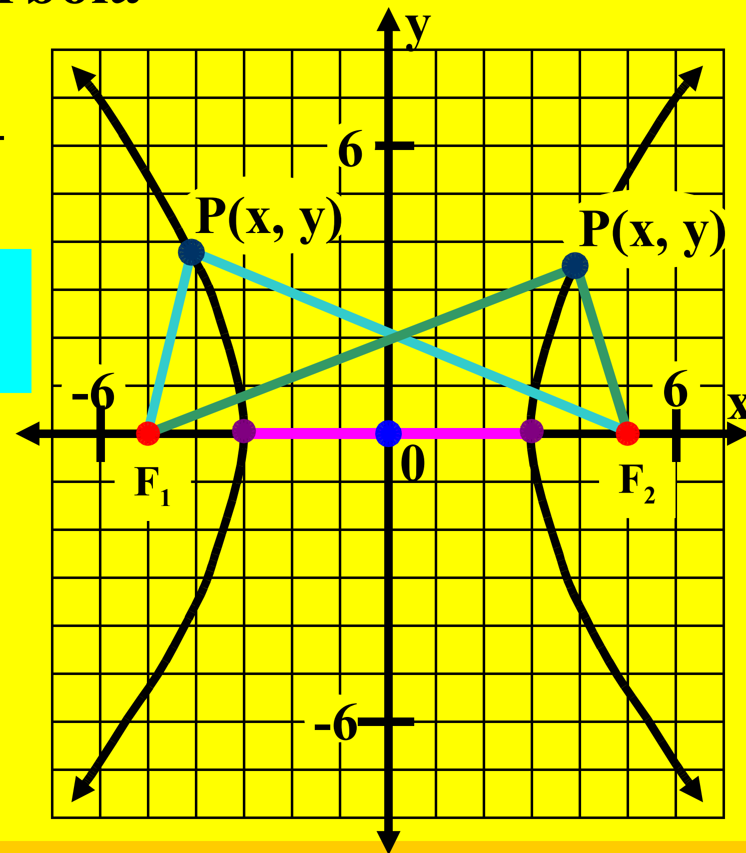

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x^2

Square the binomials.

Equations of a Hyperbola

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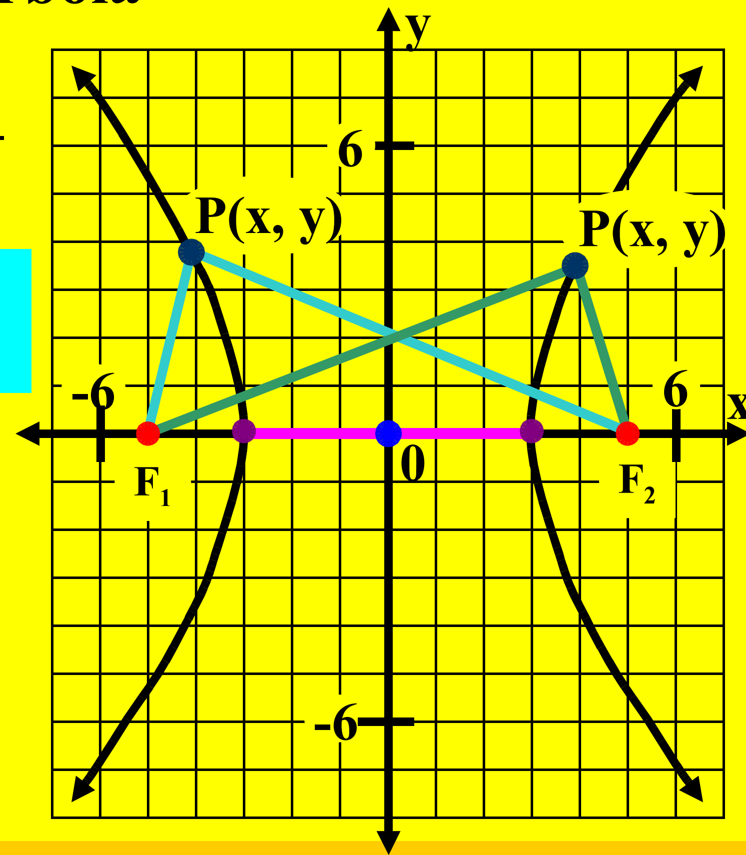

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$x^2 - 10x$

Square the binomials.

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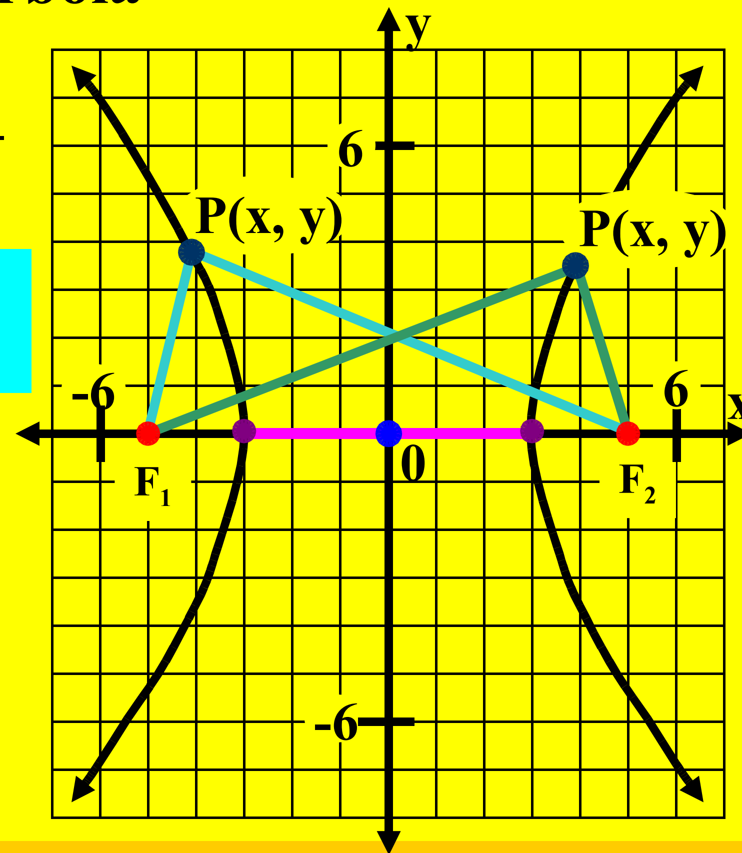

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$x^2 - 10x + 25$

Square the binomials.

Equations of a Hyperbola

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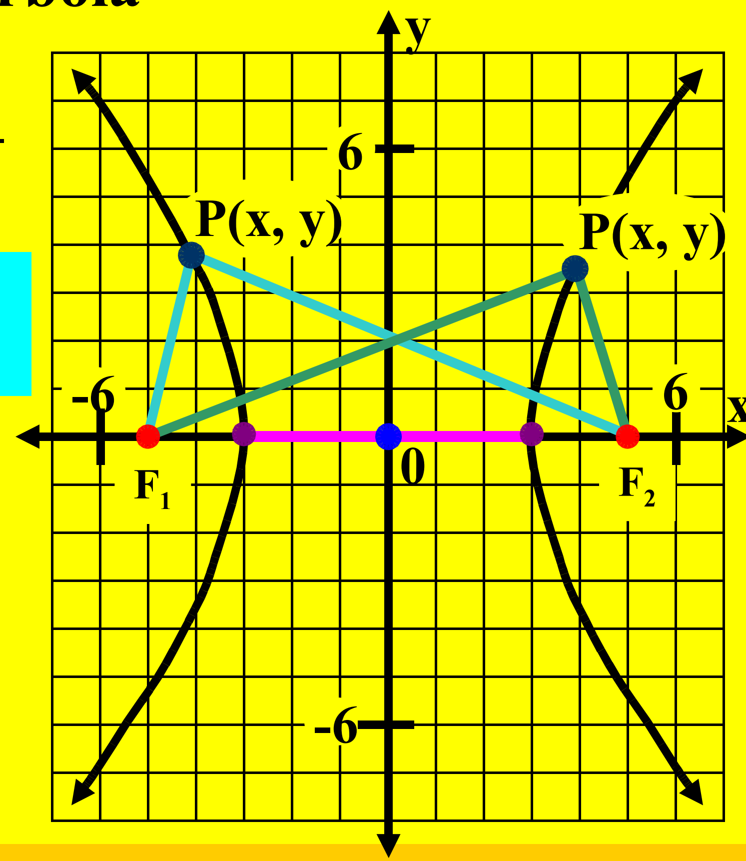

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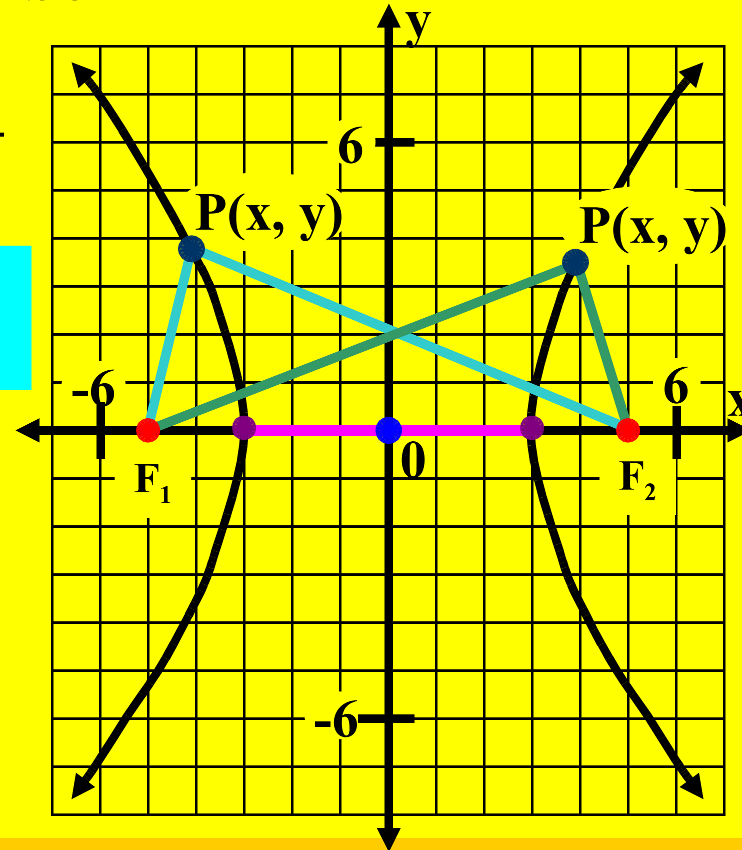

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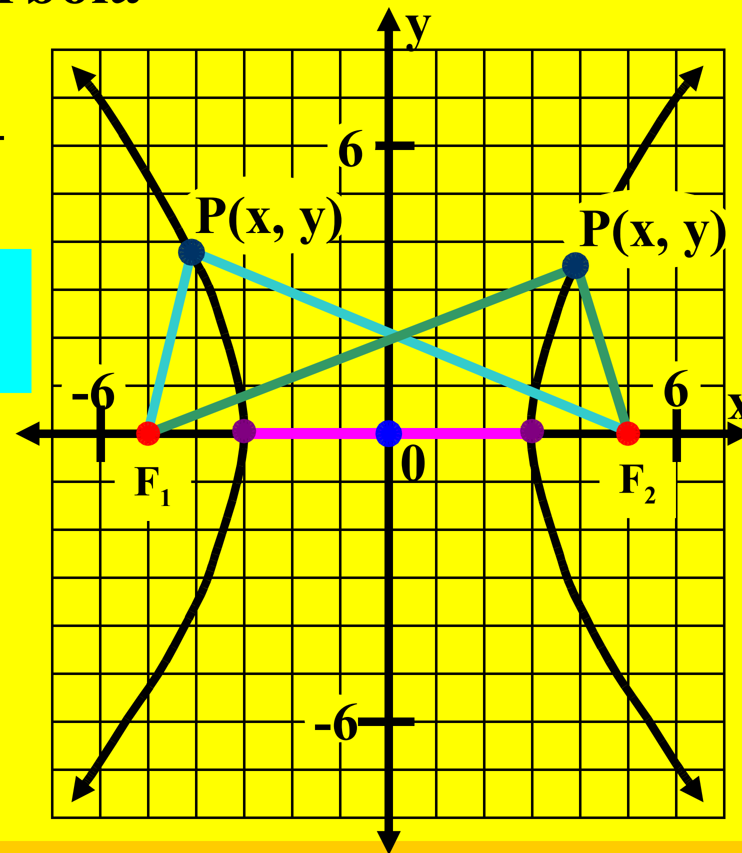

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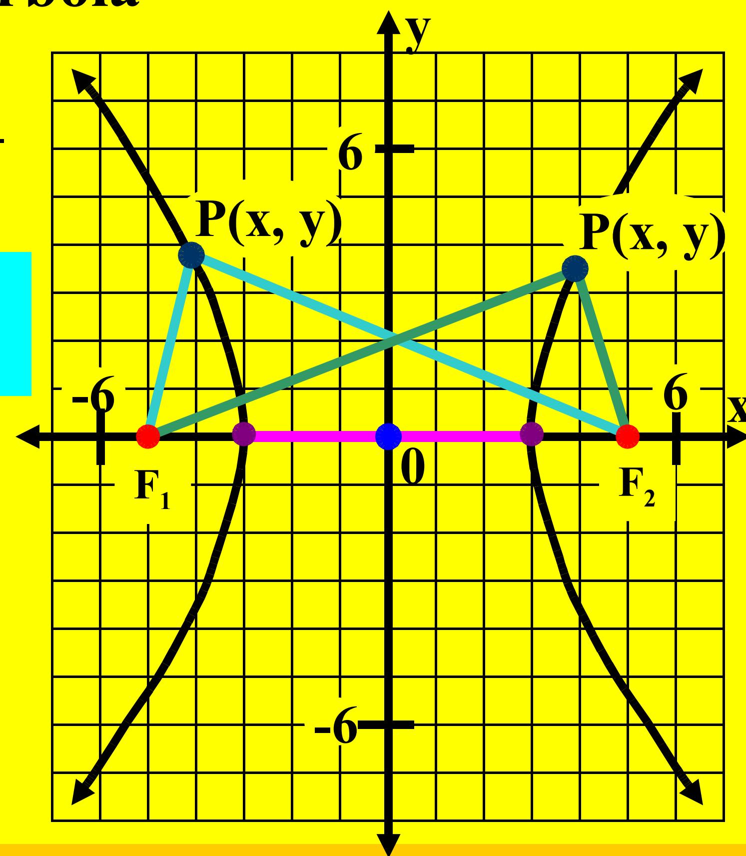

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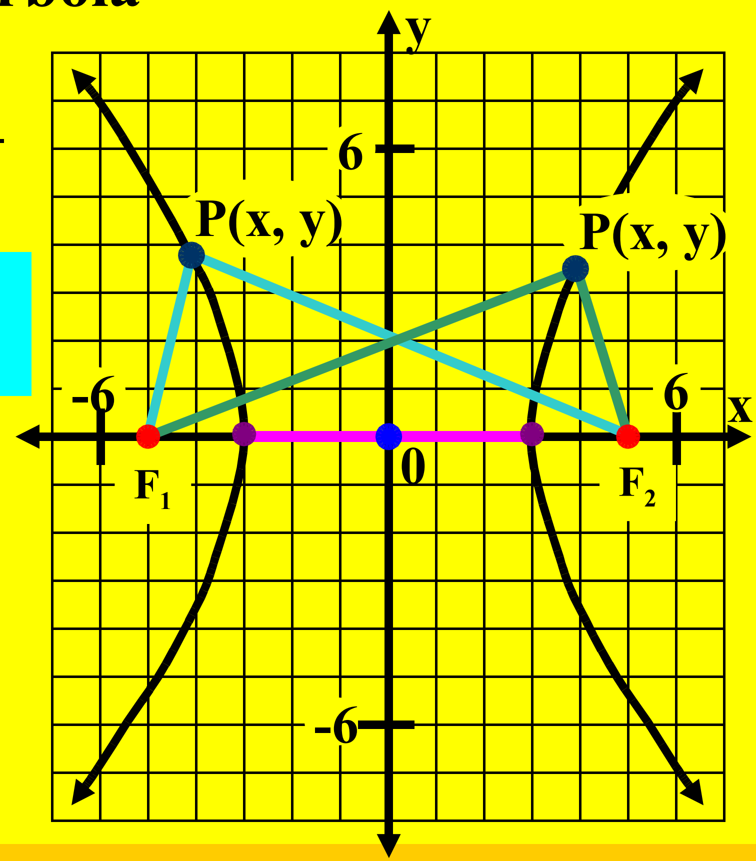

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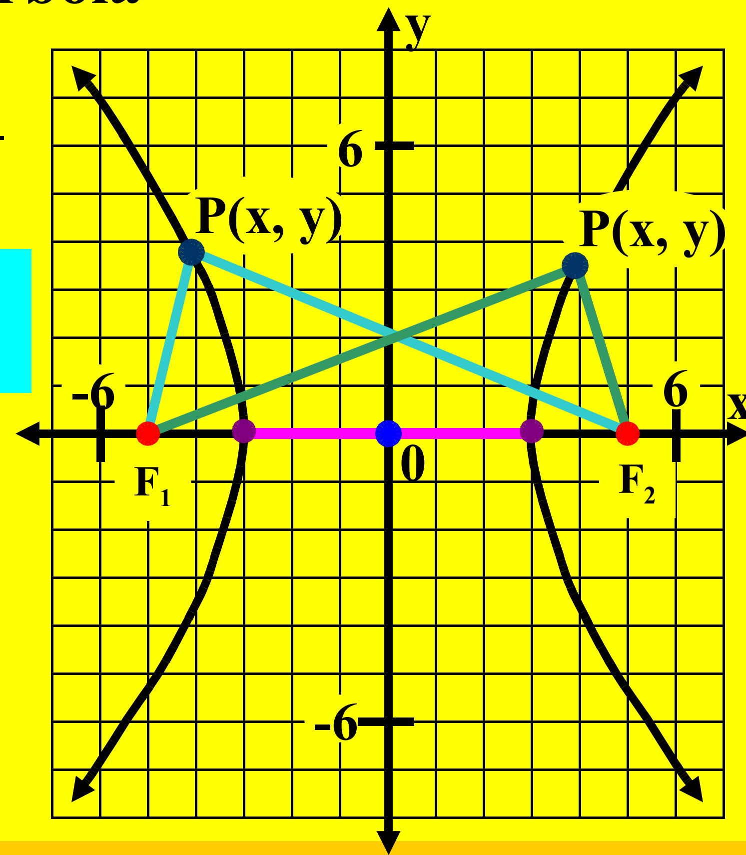

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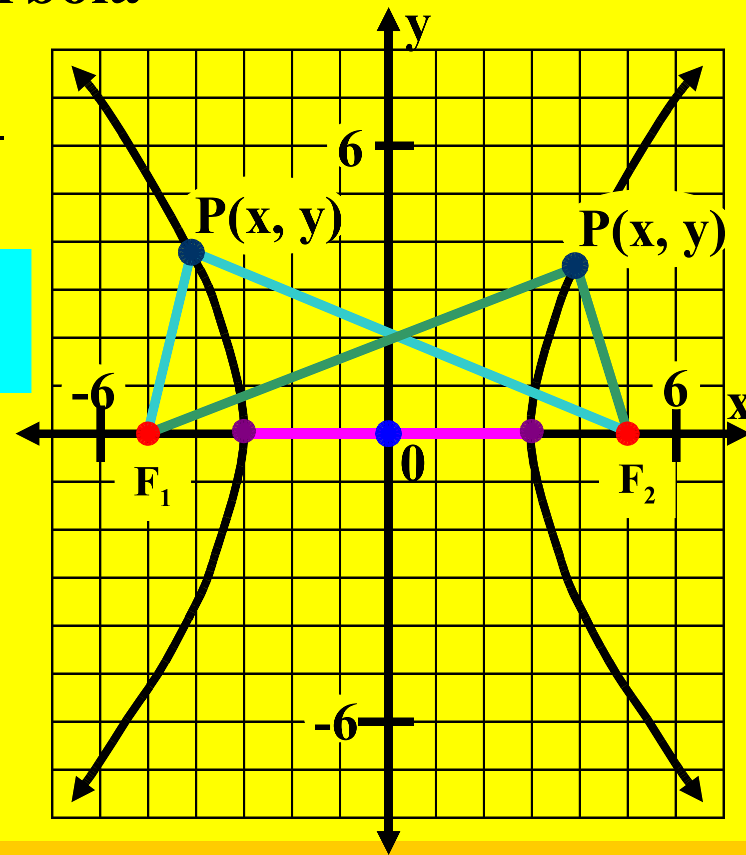

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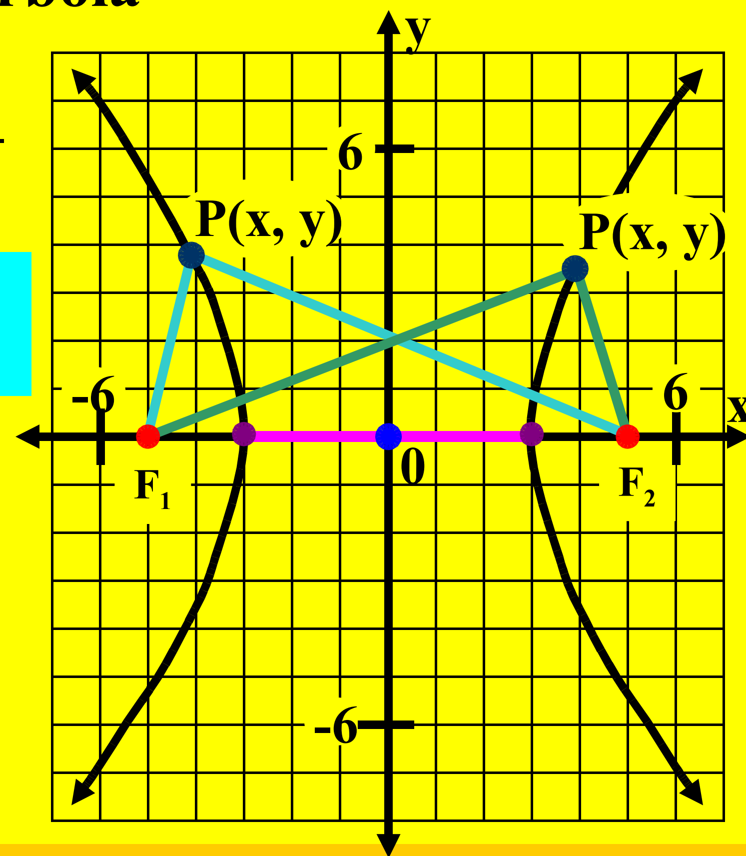

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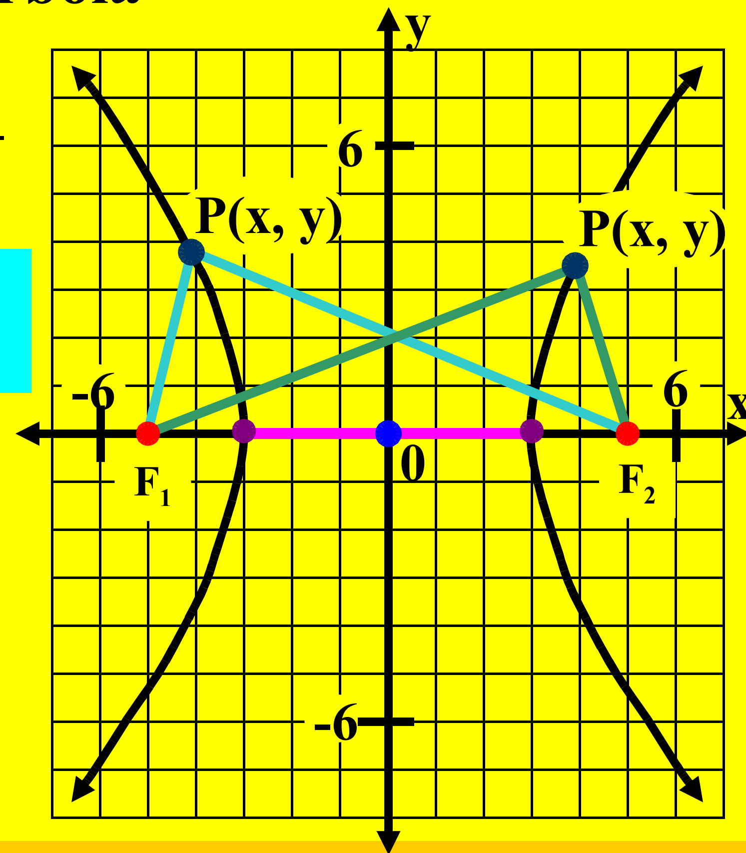

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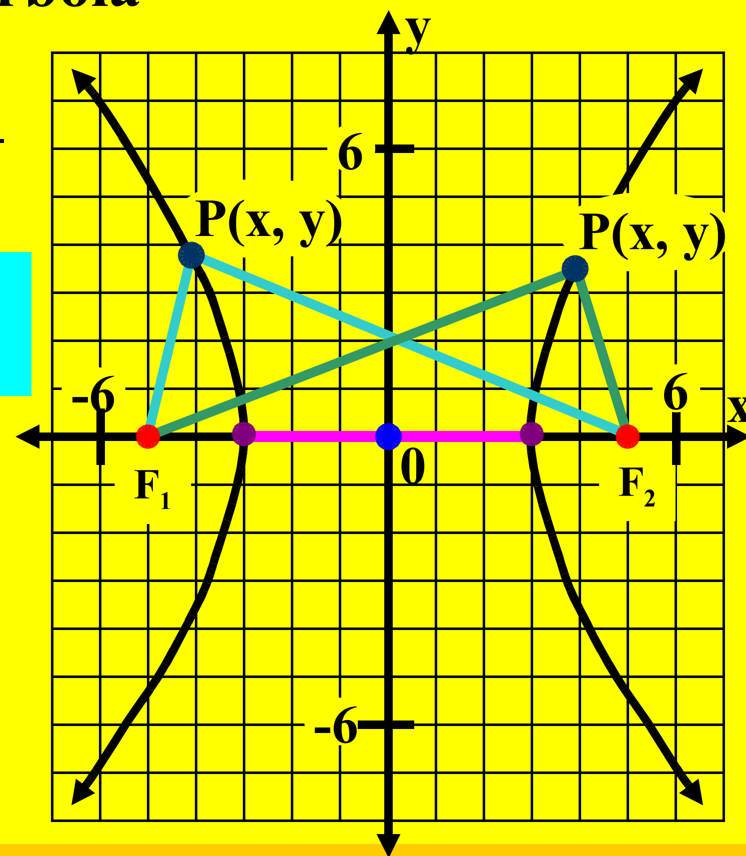

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$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

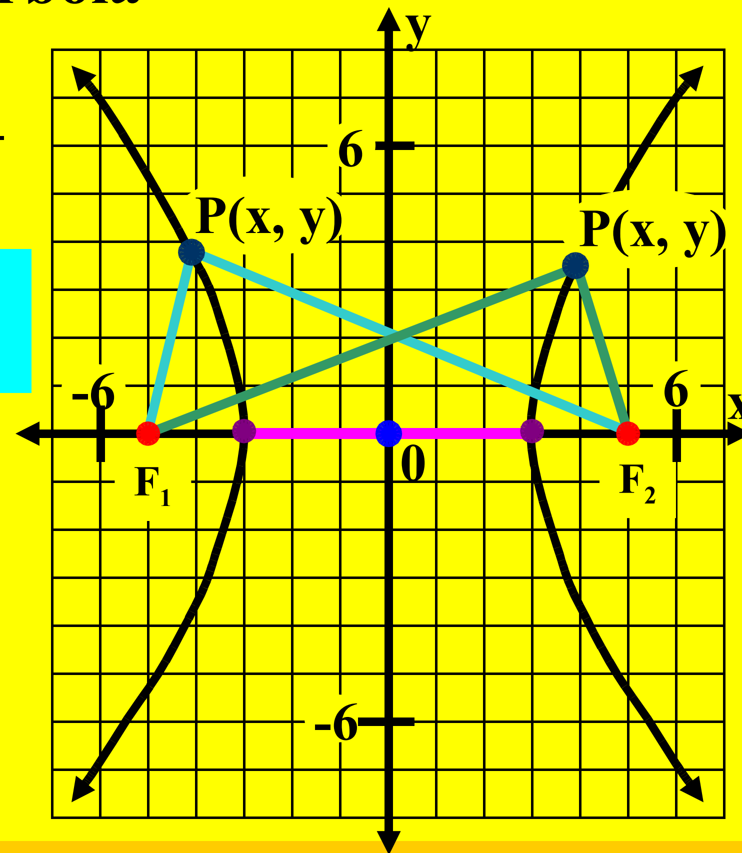
$$x^2 - 10x + 25 = x^2 + 10x + 25 \pm 12\sqrt{(x+5)^2+y^2} + 36$$

Subtract $x^2 + 25$ from both sides.

Equations of a Hyperbola

If P(x, y) represents __any point on the hyperbola__, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$



This equation is equivalent to

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

$$x^2-10x+25=x^2+10x+25\pm 12\sqrt{(x+5)^2+y^2}+36$$

-10x

Subtract x^2+25 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

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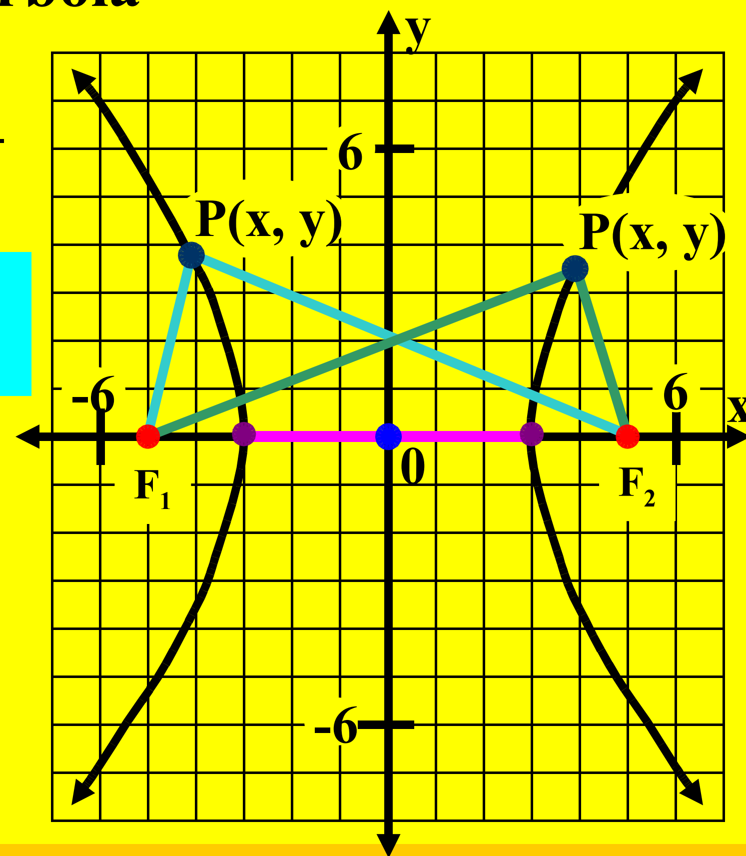

$$x^2 - 10x + 25 = x^2 + 10x + 25 \pm 12\sqrt{(x+5)^2+y^2} + 36$$

$$-10x =$$

Subtract $x^2 + 25$ from both sides.

Equations of a Hyperbola

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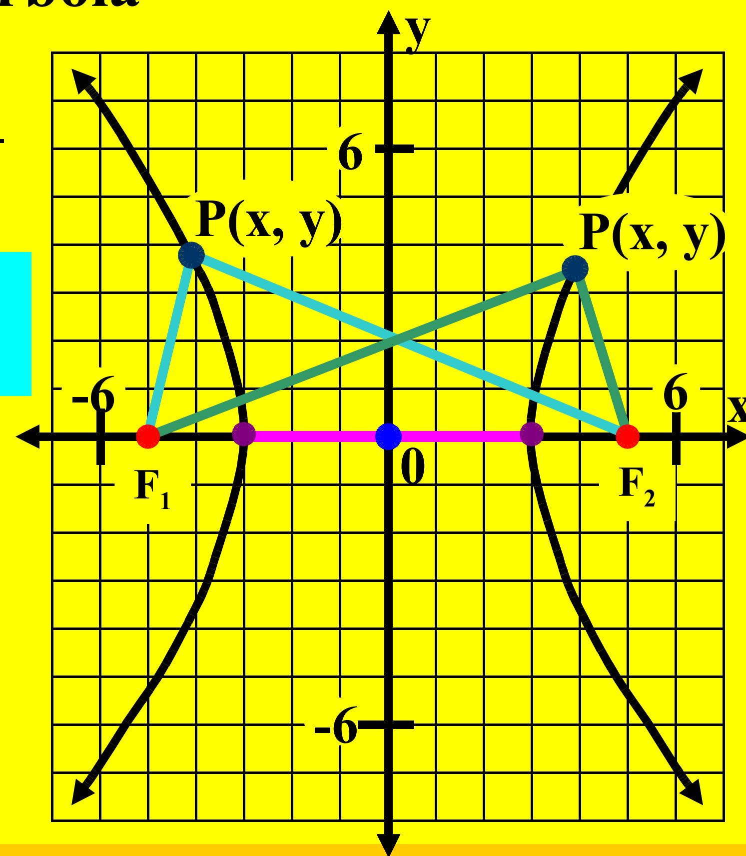

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Subtract $x^2 + 25$ from both sides.

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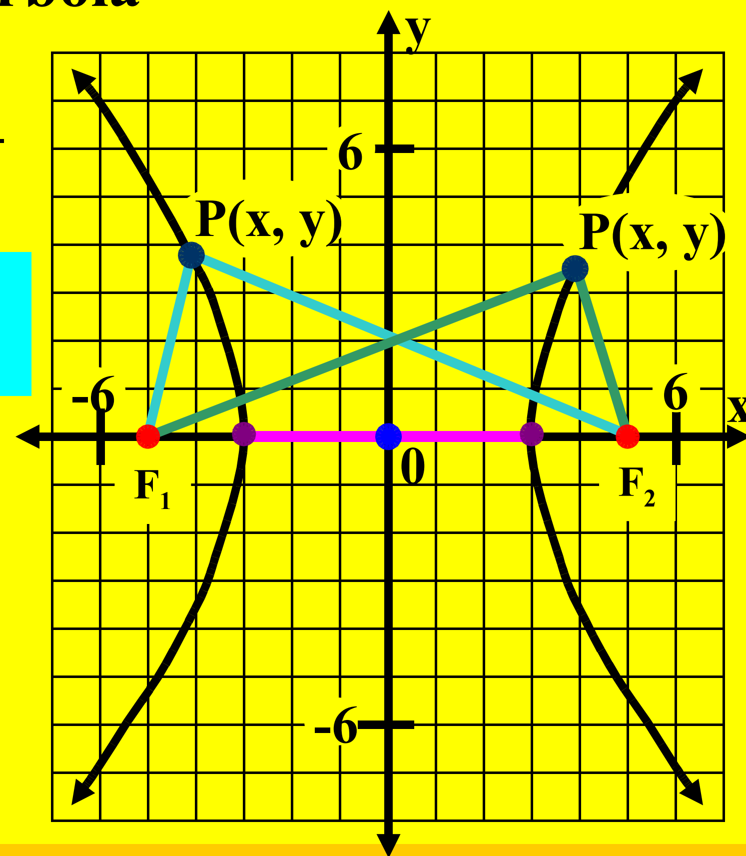

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Subtract $x^2 + 25$ from both sides.

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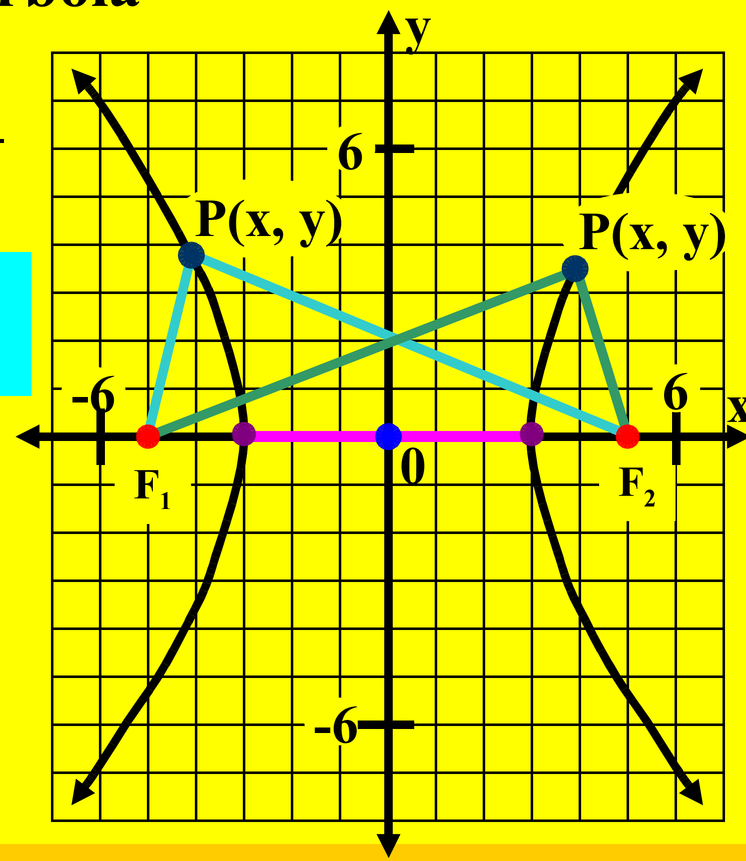

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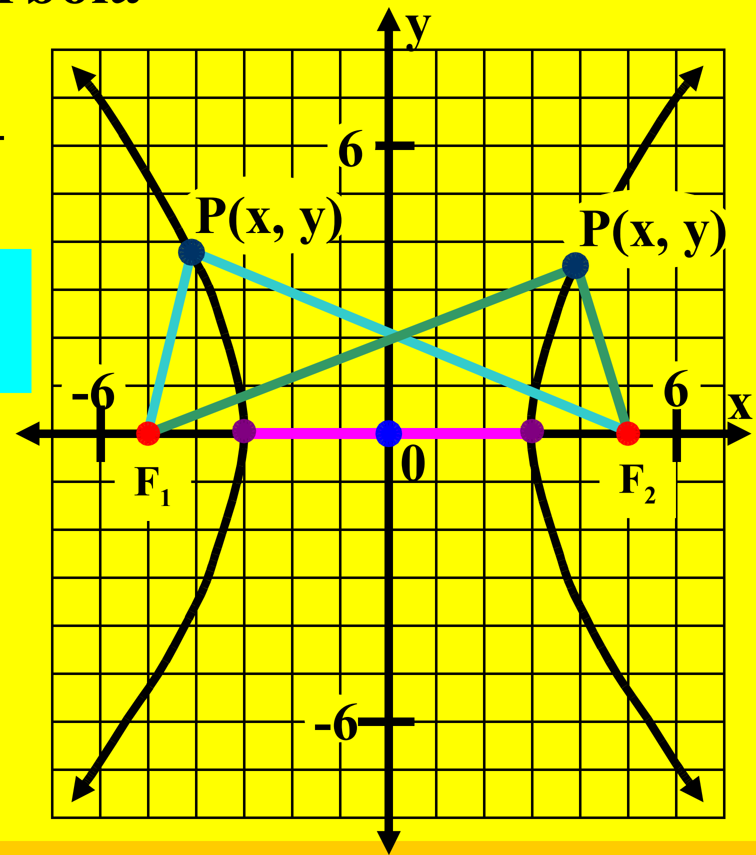

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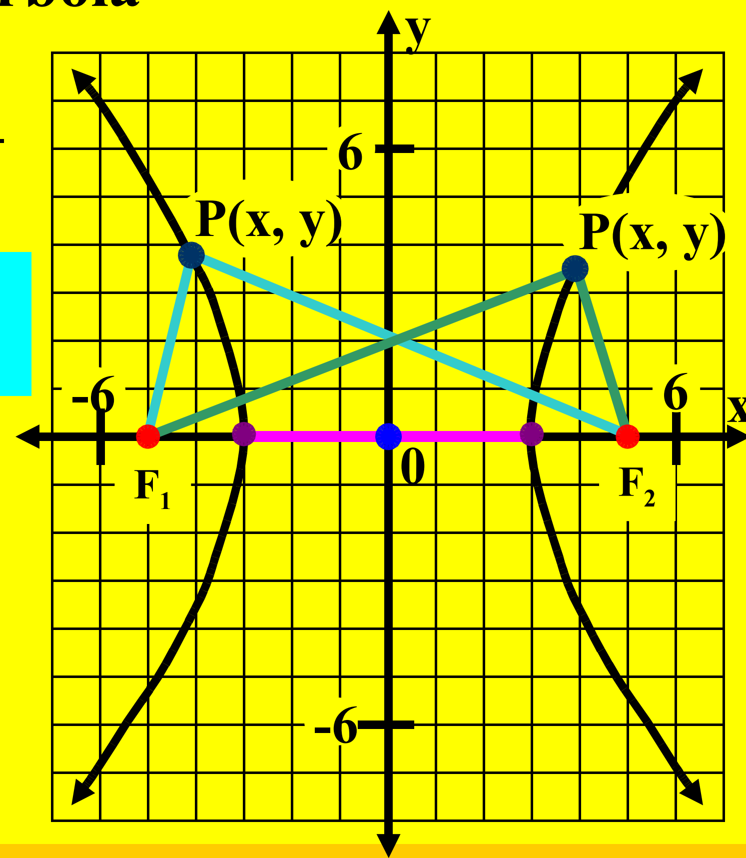

$$-10x = 10x \pm 12\sqrt{(x+5)^2+y^2}+36$$

Subtract 10x + 36 from both sides.

Equations of a Hyperbola

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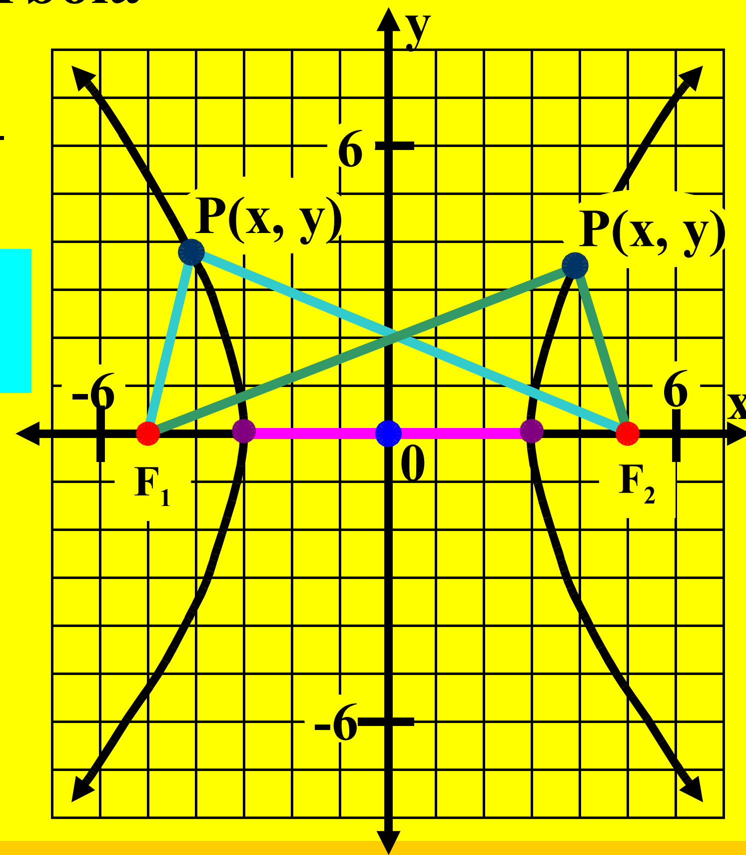

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$$-20x$$

Subtract 10x + 36 from both sides.

Equations of a Hyperbola

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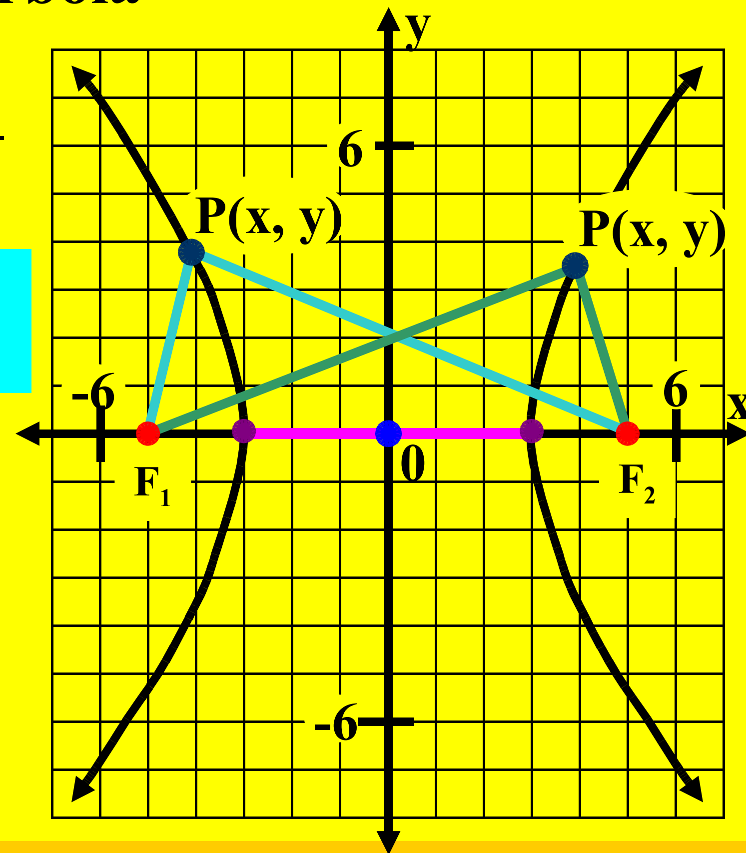

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$$-10x = 10x \pm 12\sqrt{(x+5)^2+y^2} + 36$$

$$-20x - 36$$

Subtract 10x + 36 from both sides.

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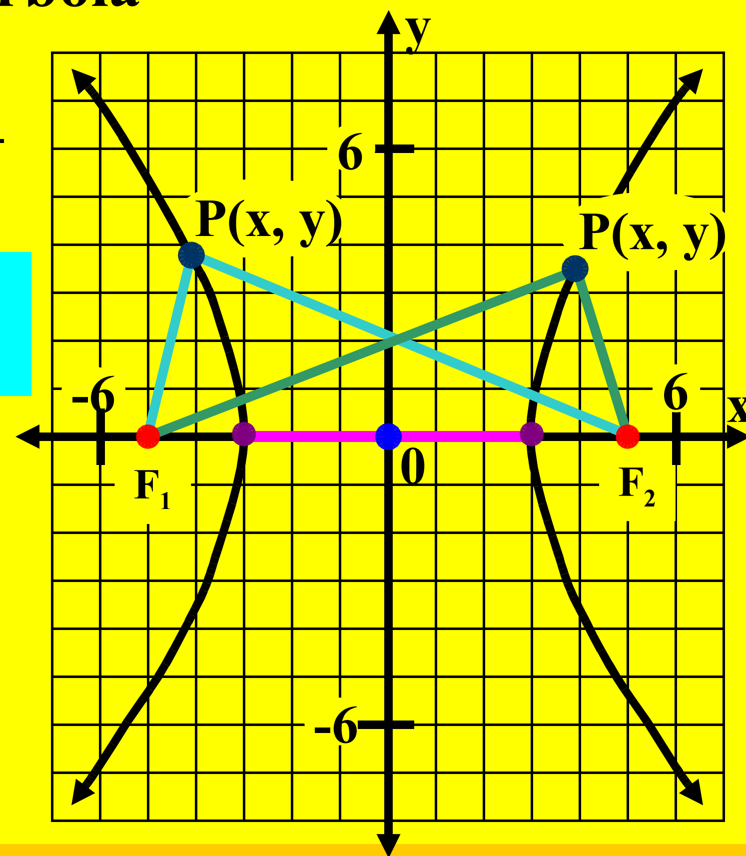

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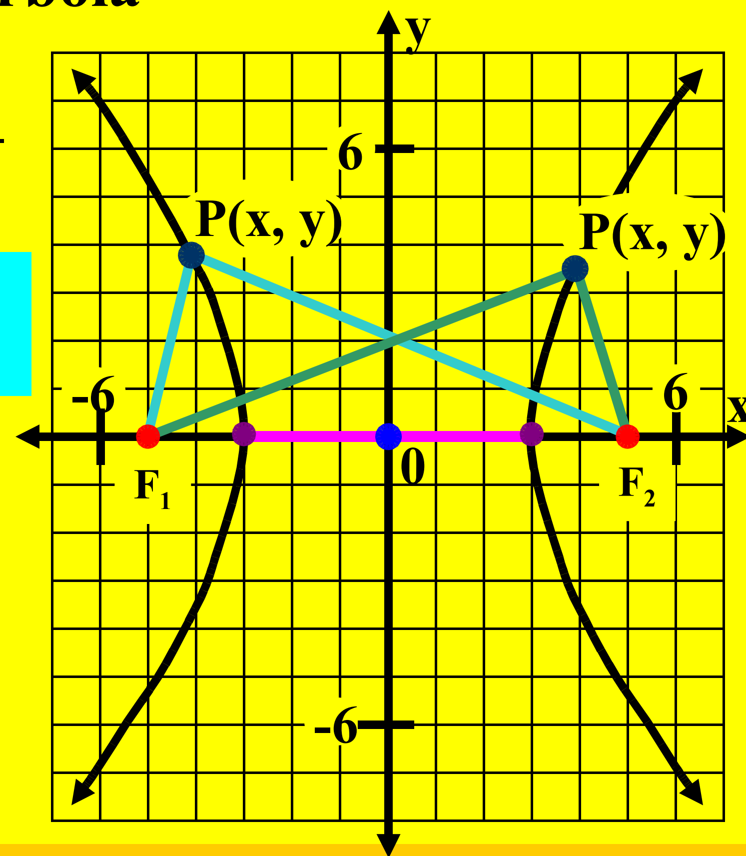

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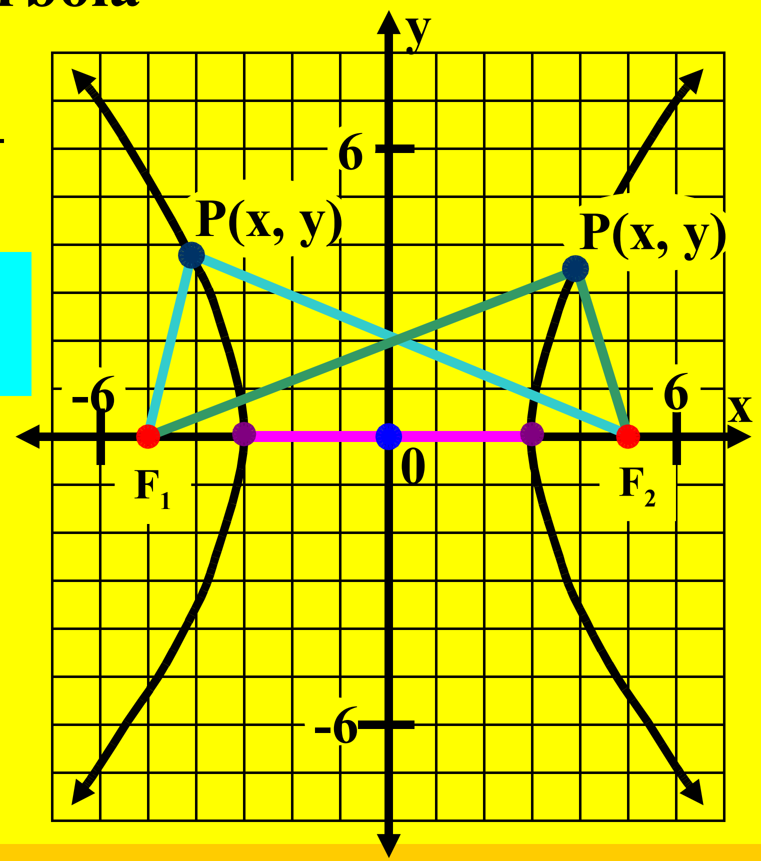

$$-10x = 10x \pm 12\sqrt{(x+5)^2+y^2} + 36$$

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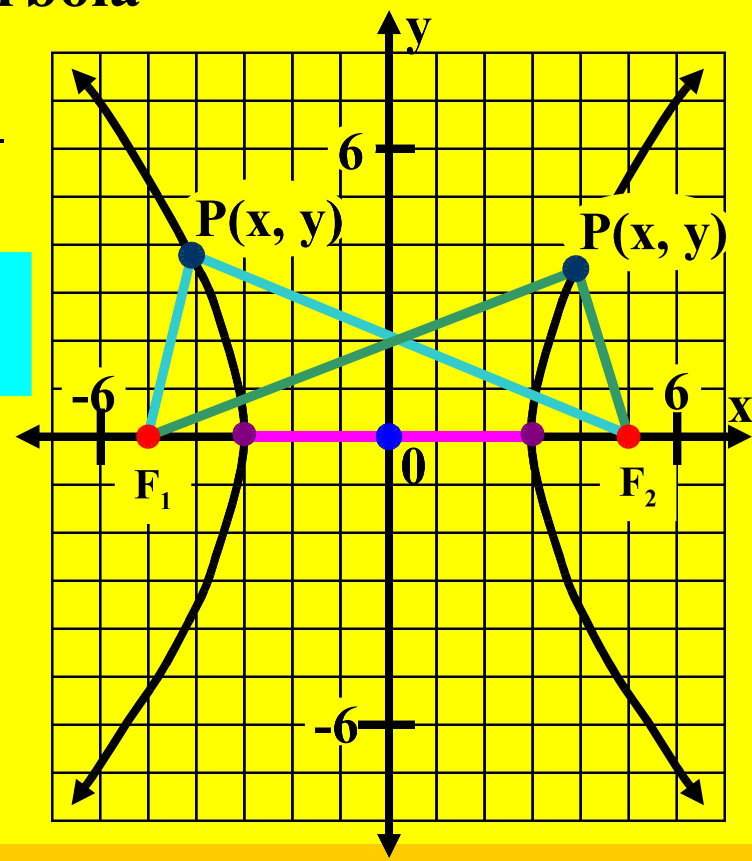

$$-20x-36=\pm 12\sqrt{(x+5)^2+y^2}$$

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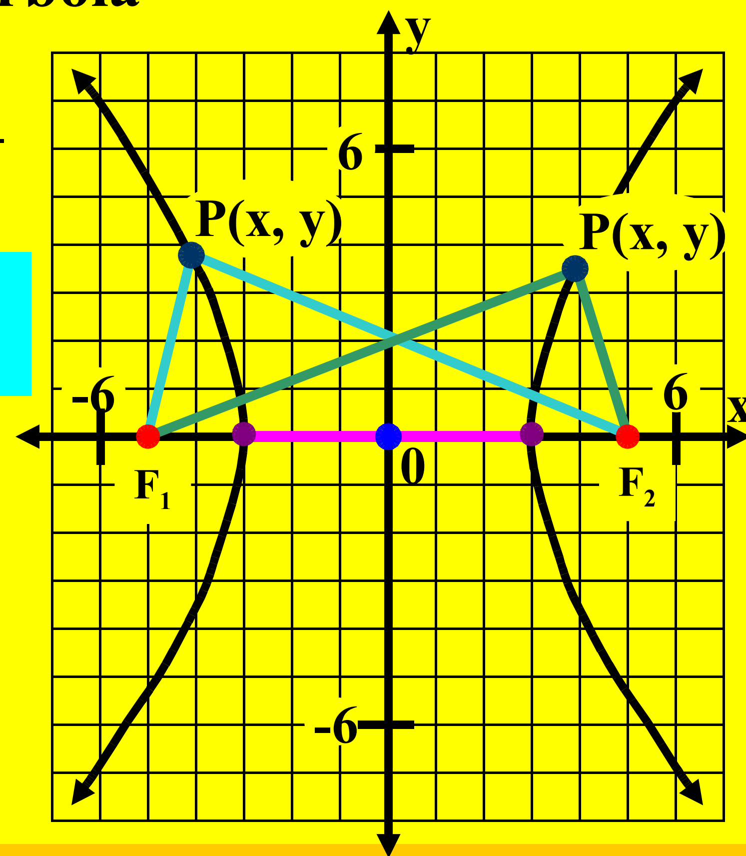

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Divide both sides by -4.

Equations of a Hyperbola

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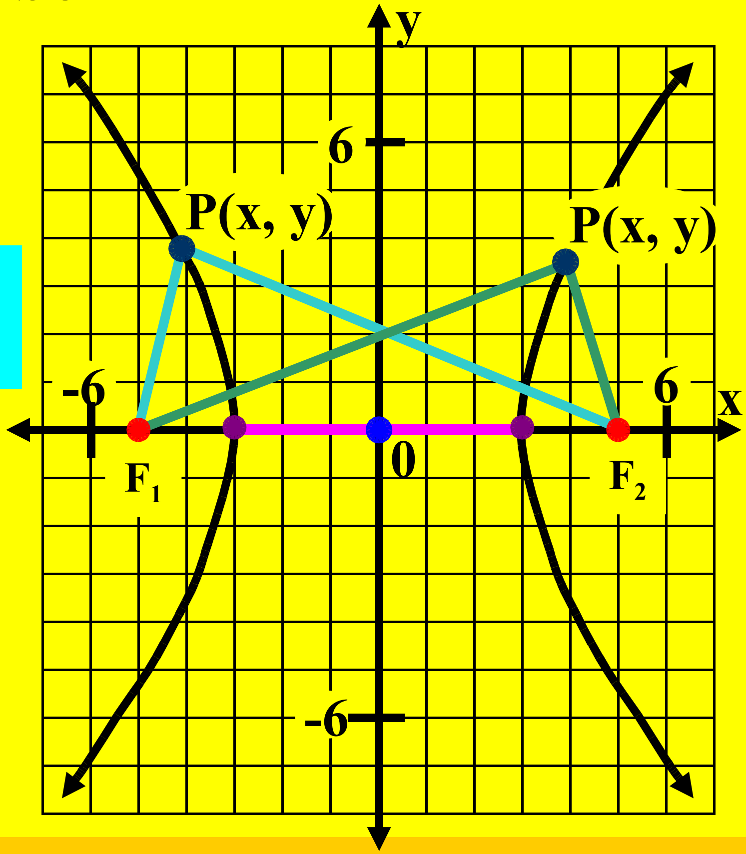

$$-20x-36=\pm 12\sqrt{(x+5)^2+y^2}$$

5x

Divide both sides by -4.

Equations of a Hyperbola

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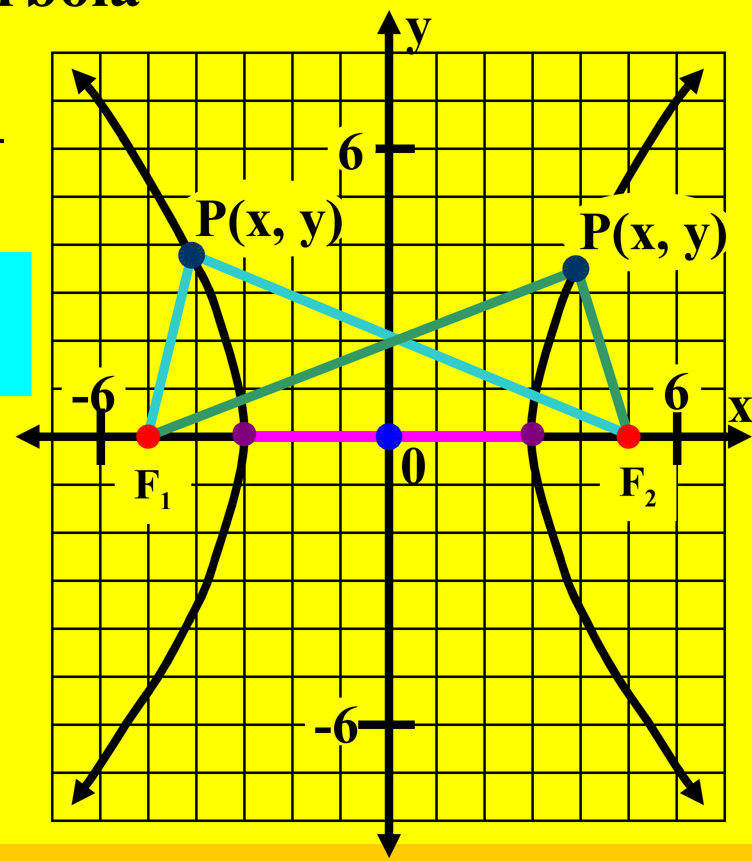

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Divide both sides by -4.

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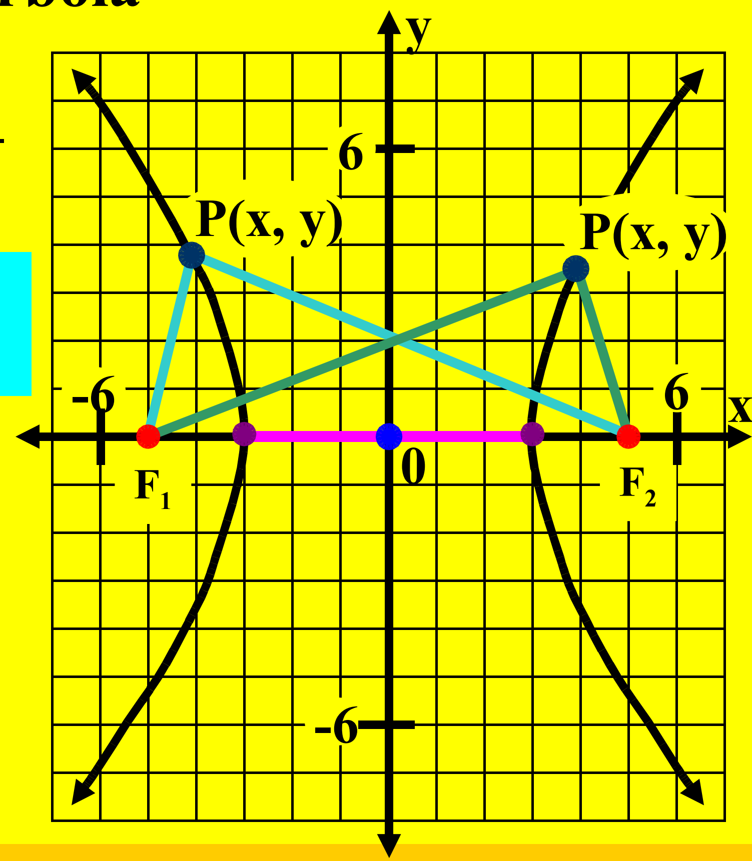

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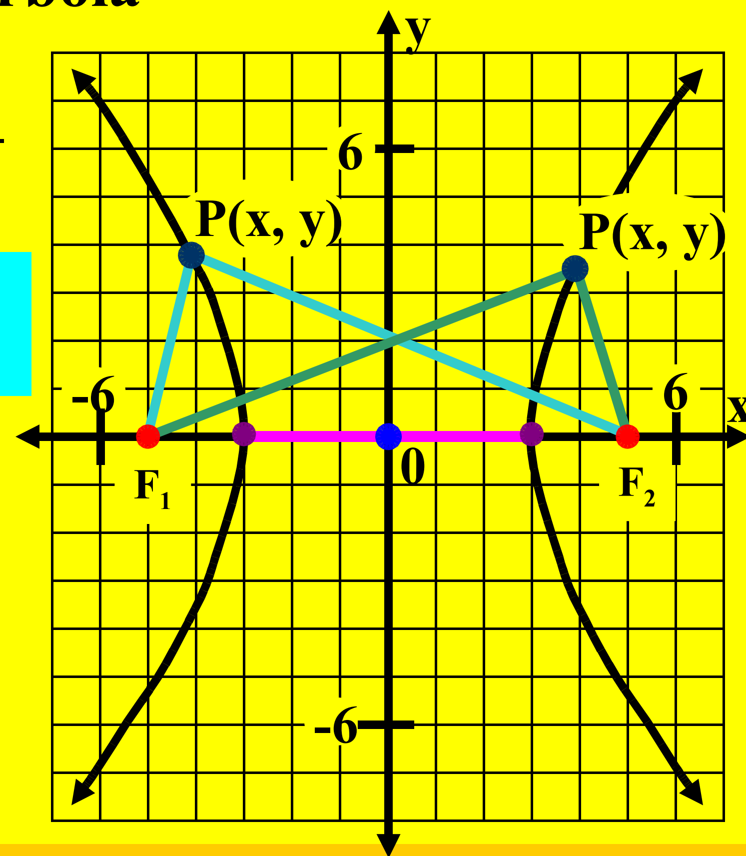

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Divide both sides by -4.

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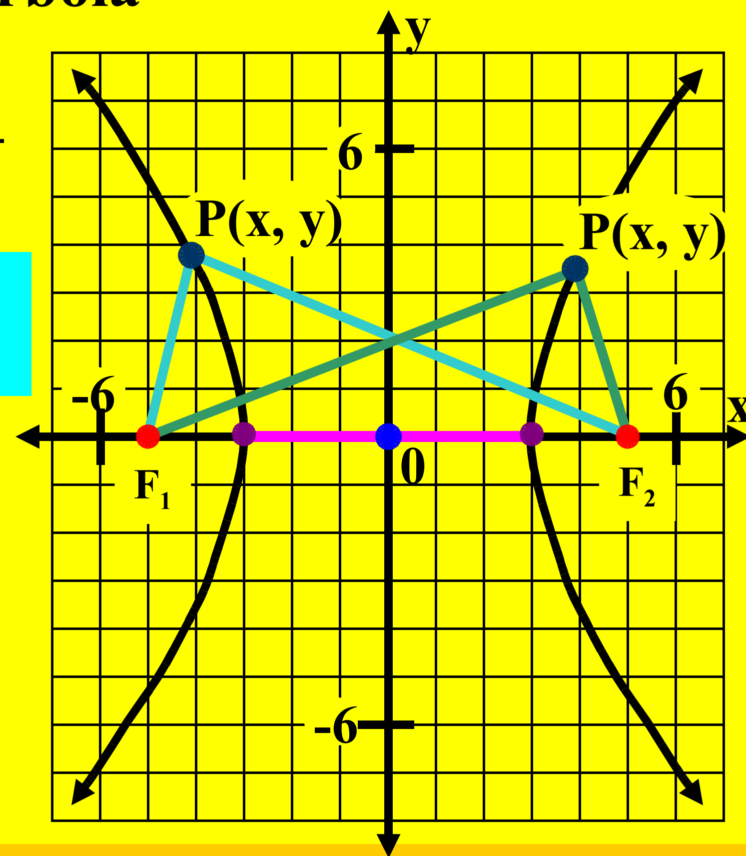

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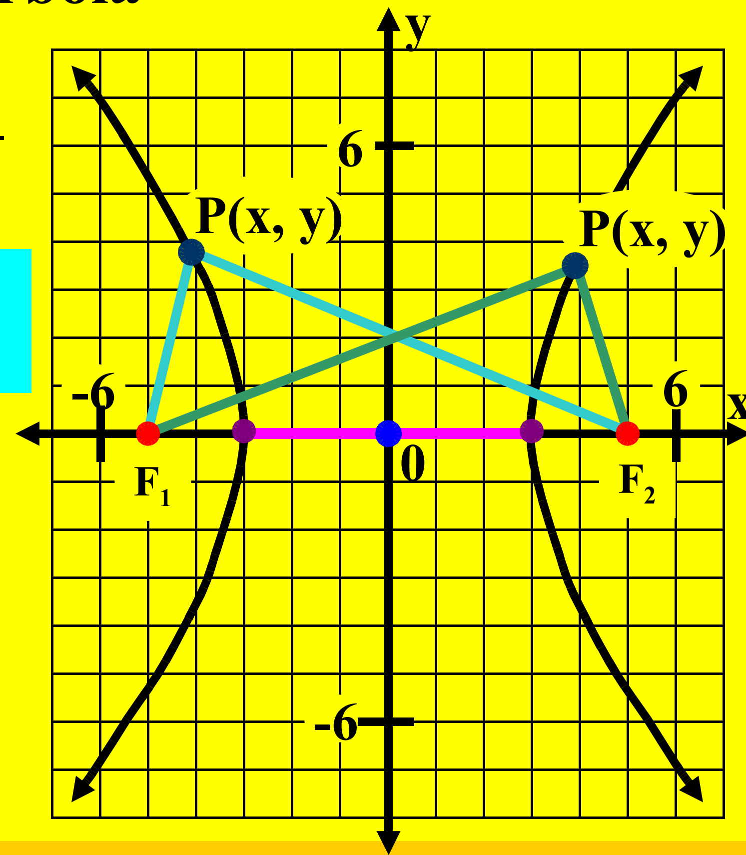

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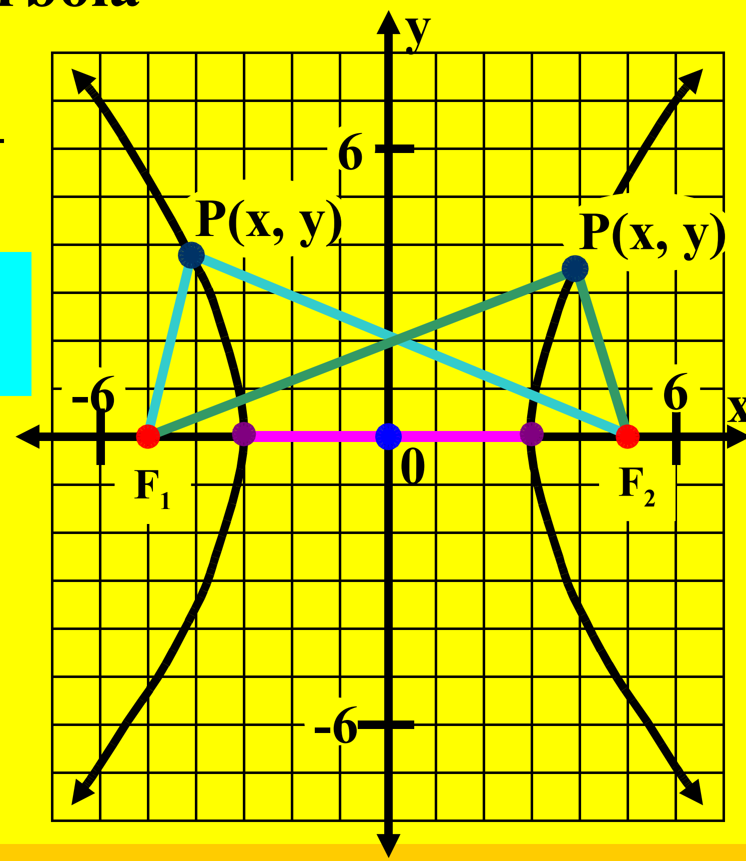

$$5x+9=\pm 3\sqrt{(x+5)^2+y^2}$$

Square both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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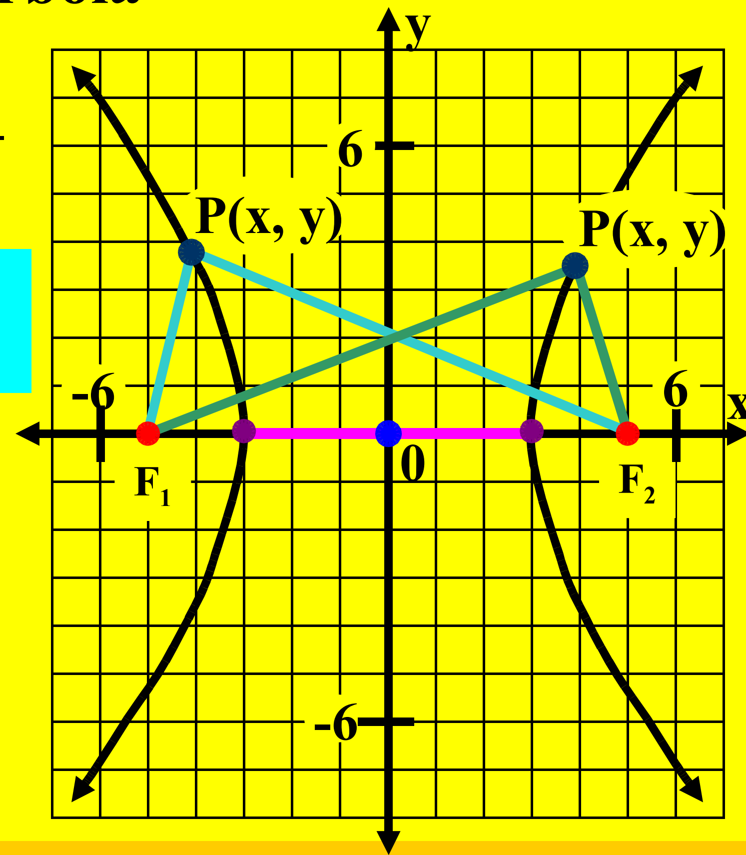

$$5x+9=\pm 3\sqrt{(x+5)^2+y^2}$$

$$(5x+9)^2$$

Square both sides.

Equations of a Hyperbola

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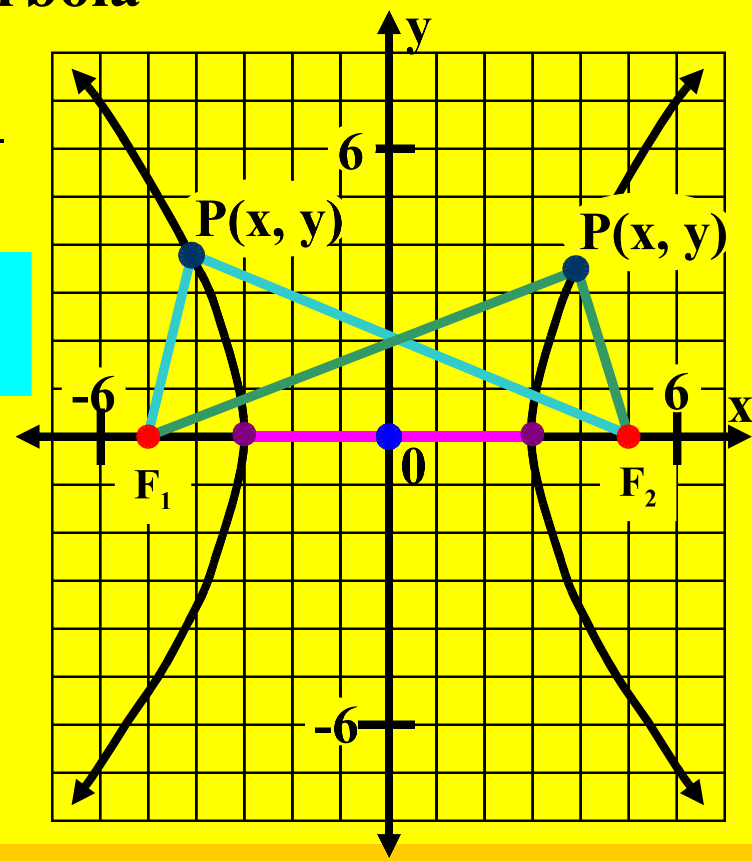

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Square both sides.

Equations of a Hyperbola

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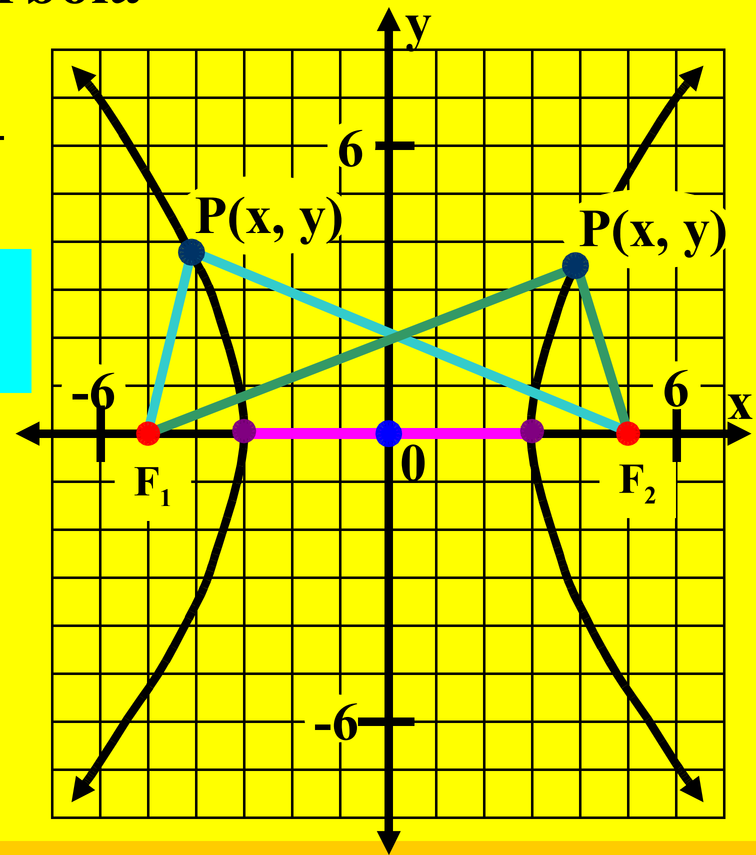

$$5x+9=\pm 3\sqrt{(x+5)^2+y^2}$$

$$(5x+9)^2=9[$$

Square both sides.

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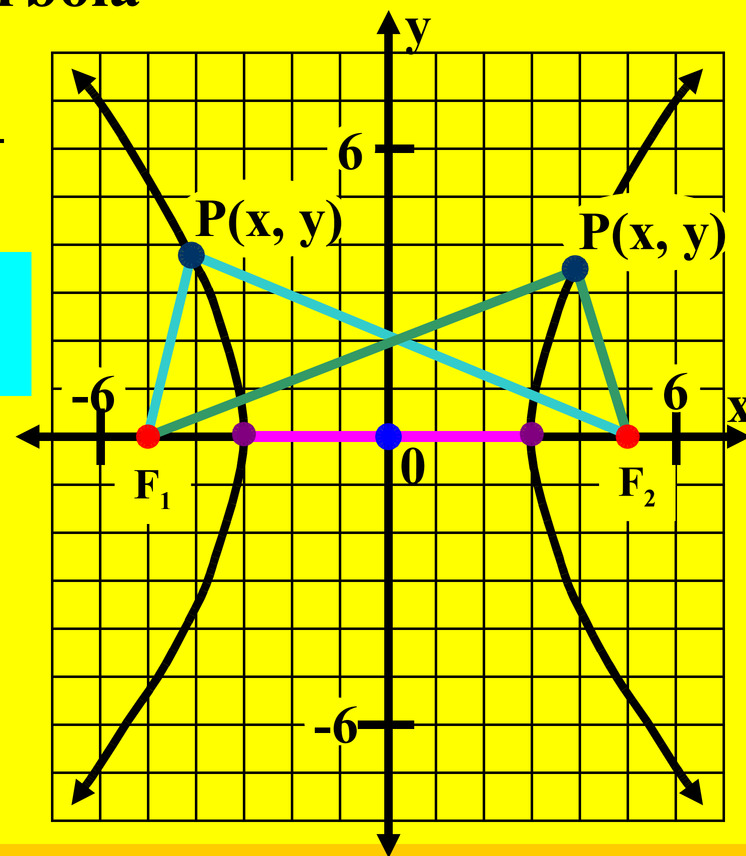

$$5x + 9 = \pm 3\sqrt{(x+5)^2+y^2}$$

$$(5x+9)^2 = 9[(x+5)^2+y^2]$$

Square both sides.

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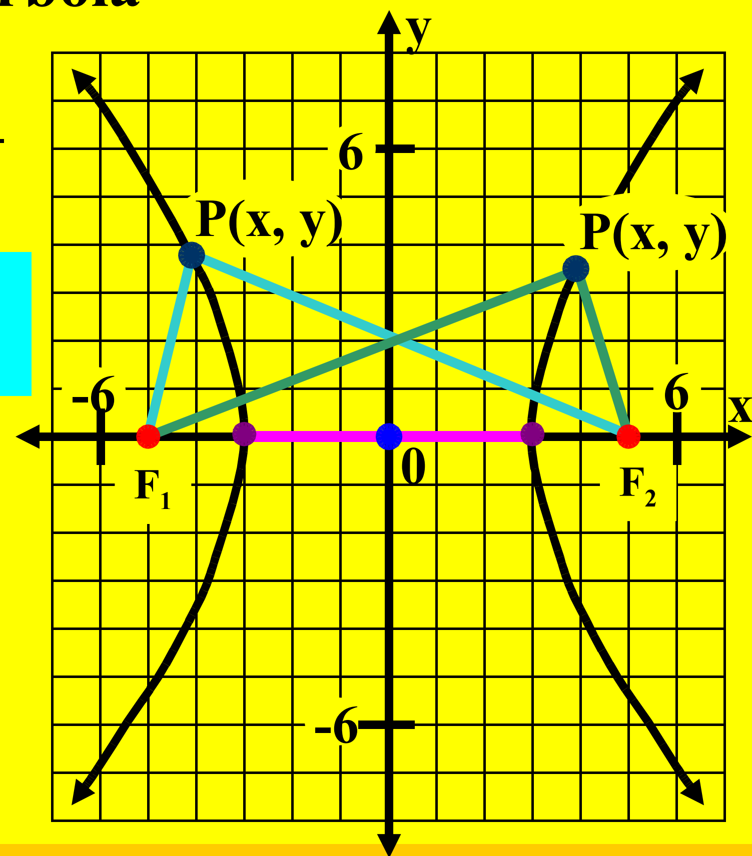

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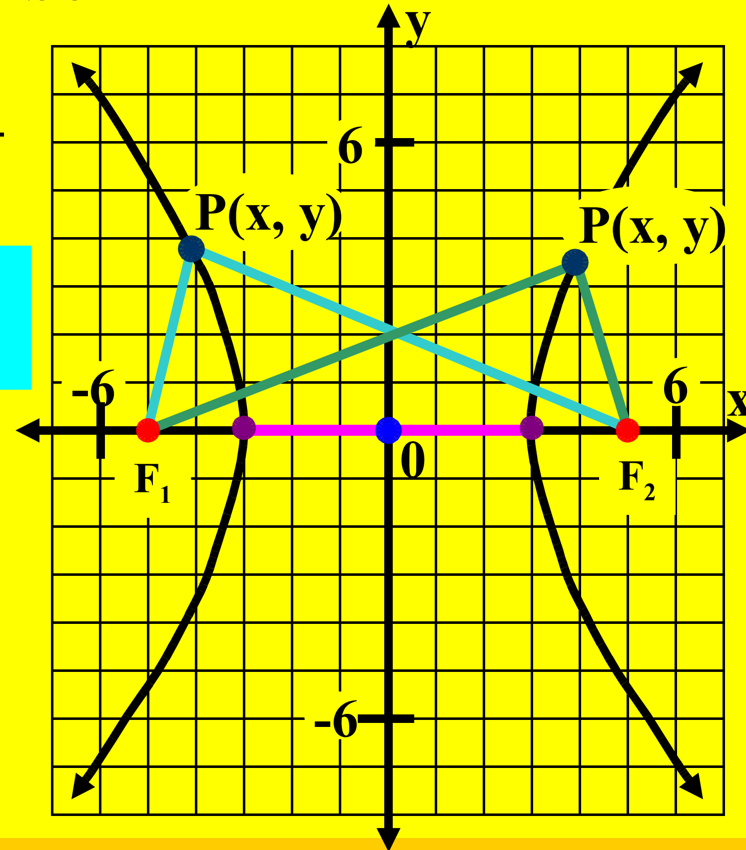

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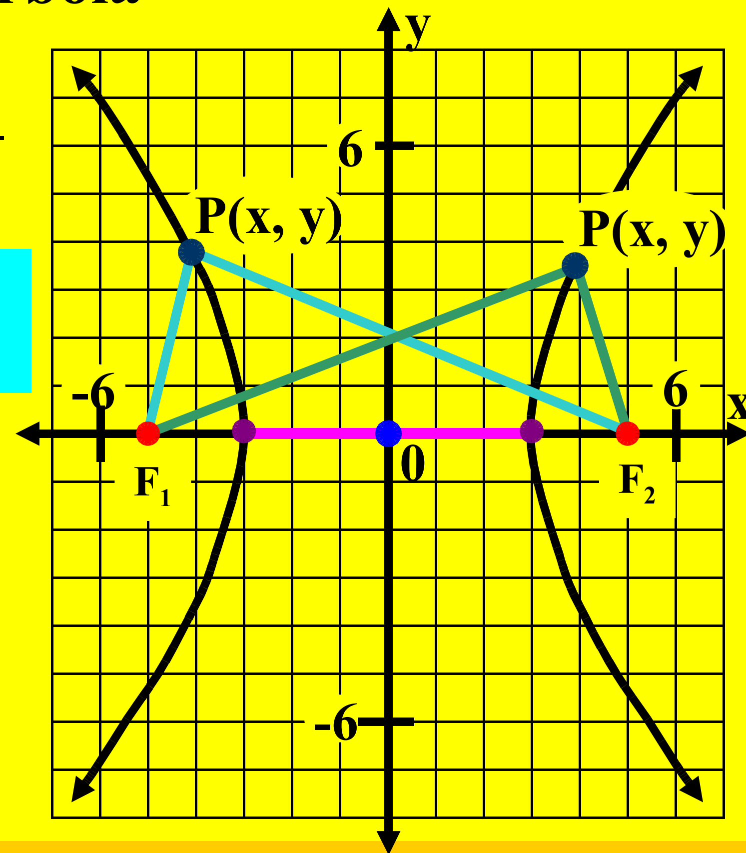

$$(5x+9)^2 = 9[(x+5)^2 + y^2]$$

Square the binomials.

Equations of a Hyperbola

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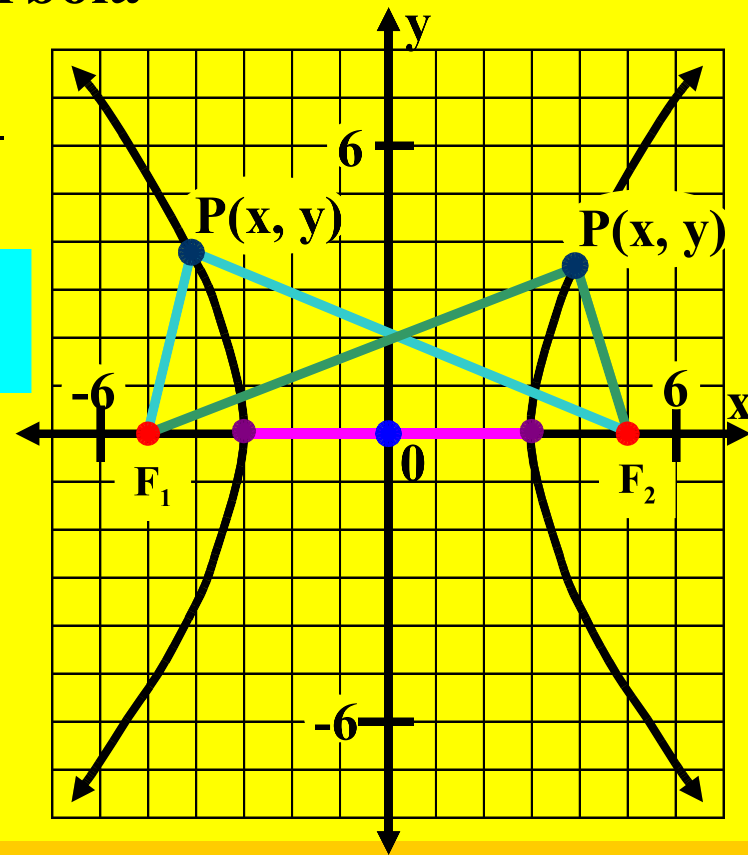

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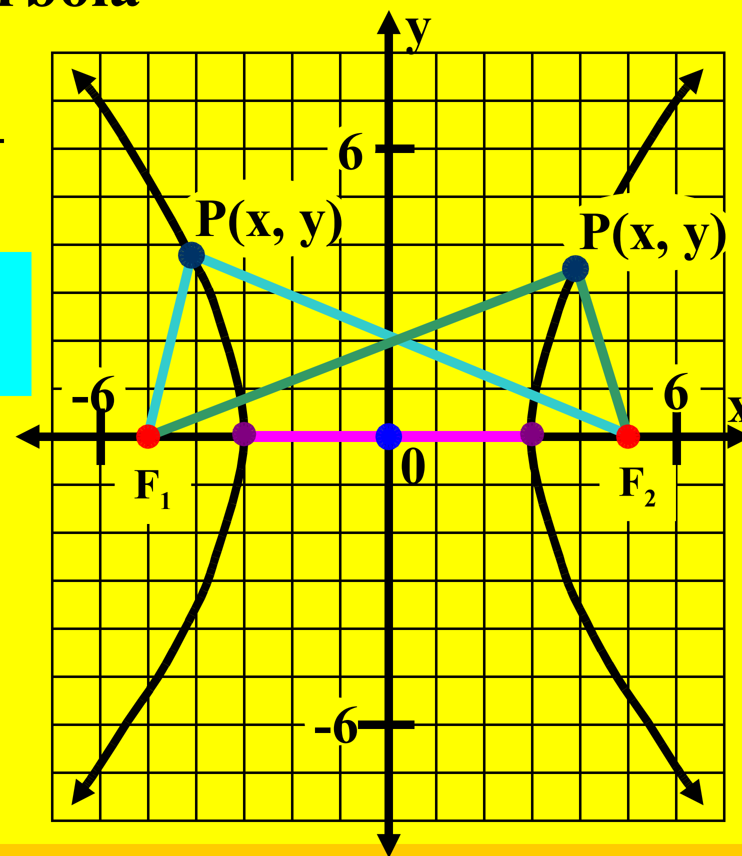

$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

$25x^2$

Square the binomials.

Equations of a Hyperbola

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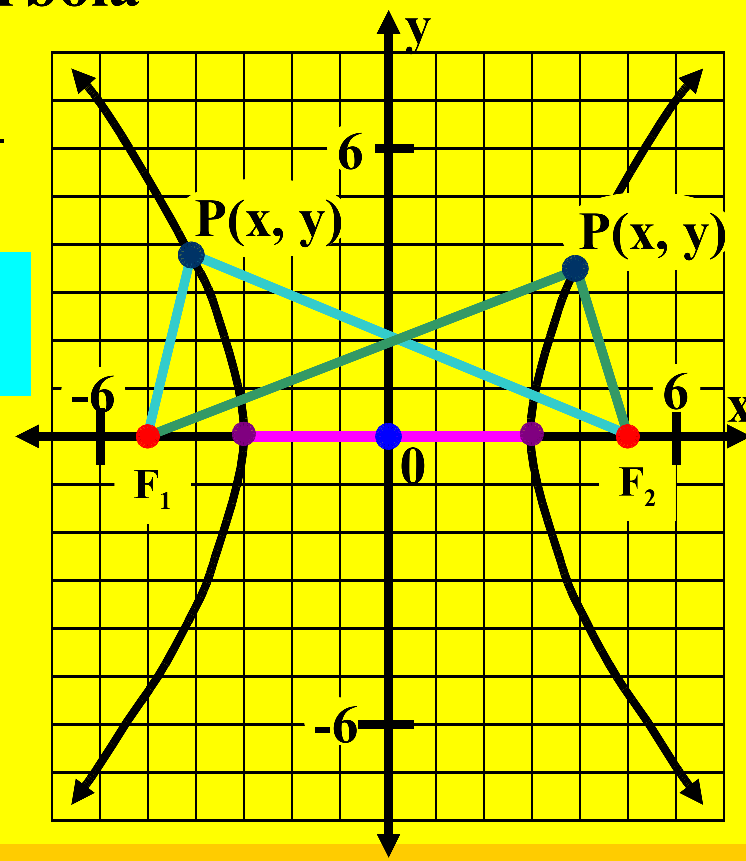

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$$25x^2 + 90x$$

Square the binomials.

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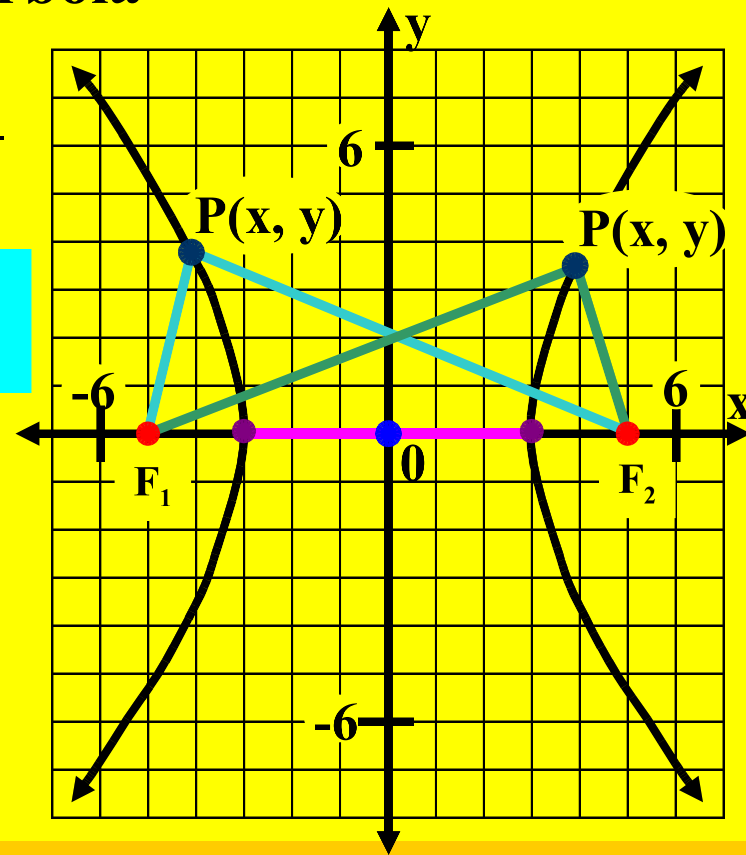

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$$(5x+9)^2 = 9[(x+5)^2+y^2]$$

$$25x^2 + 90x + 81$$

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Equations of a Hyperbola

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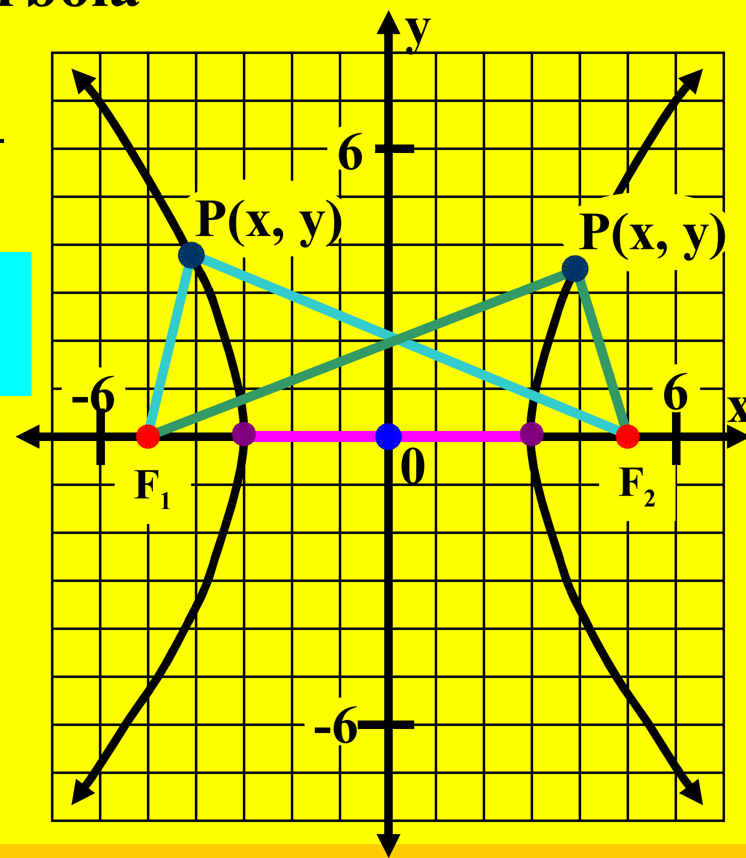


$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

$$25x^2 + 90x + 81 =$$

Square the binomials.

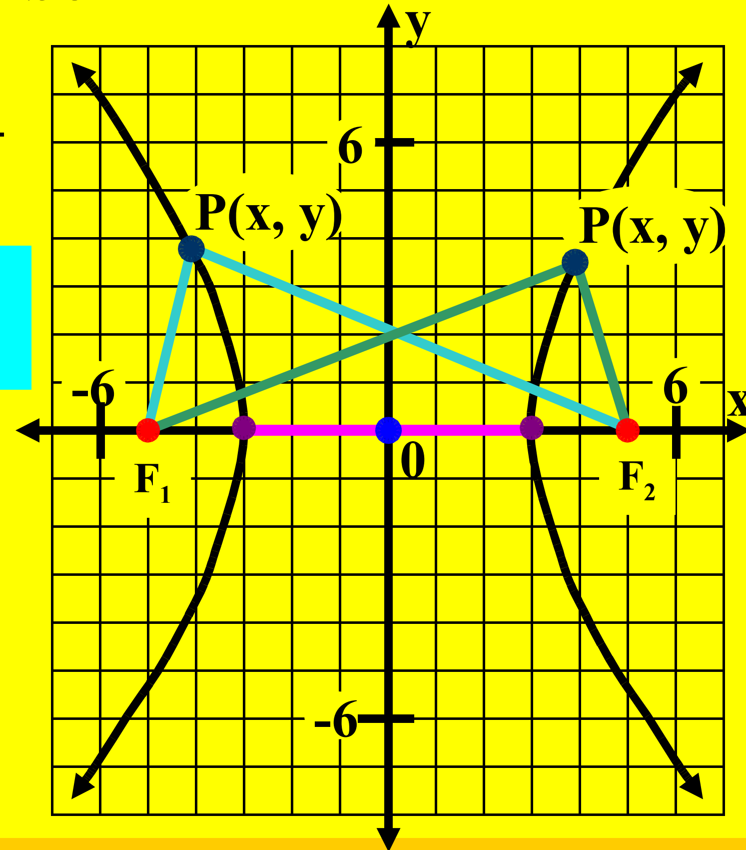
Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2 + y^2} - \sqrt{(x+5)^2 + y^2} = \pm 6$$

This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$



$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

$$25x^2 + 90x + 81 = 9[$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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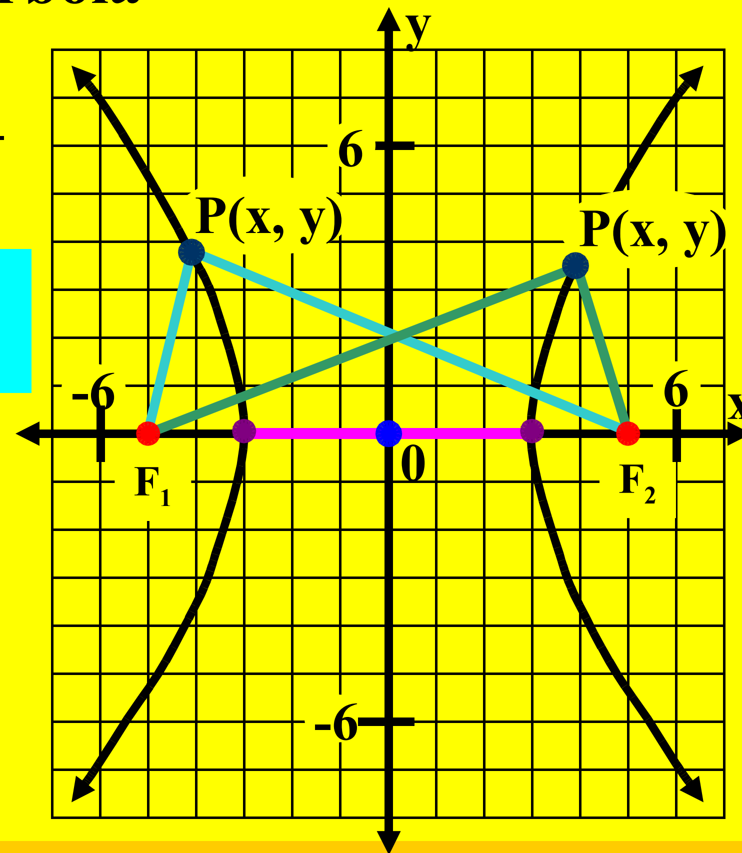

$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

$$25x^2 + 90x + 81 = 9[$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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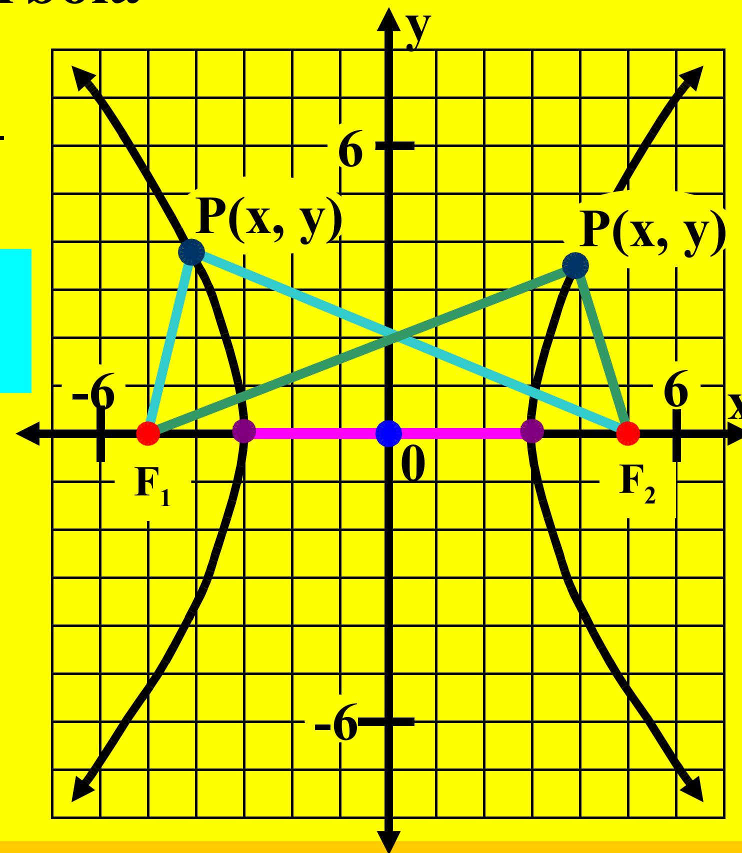

$$(5x+9)^2=9[(x+5)^2+y^2]$$

$$25x^2+90x+81=9[x^2$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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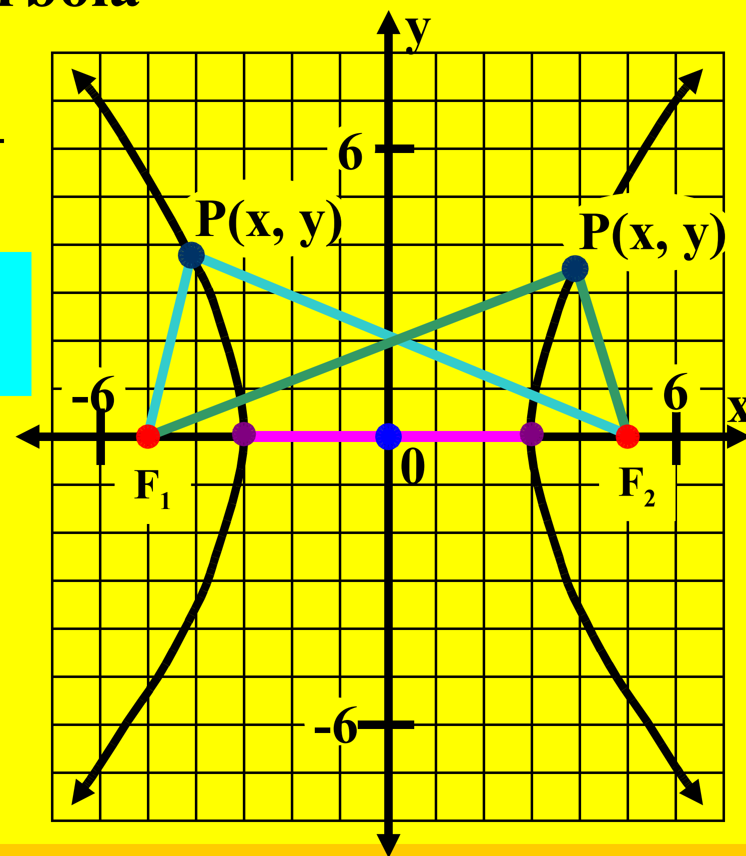


This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

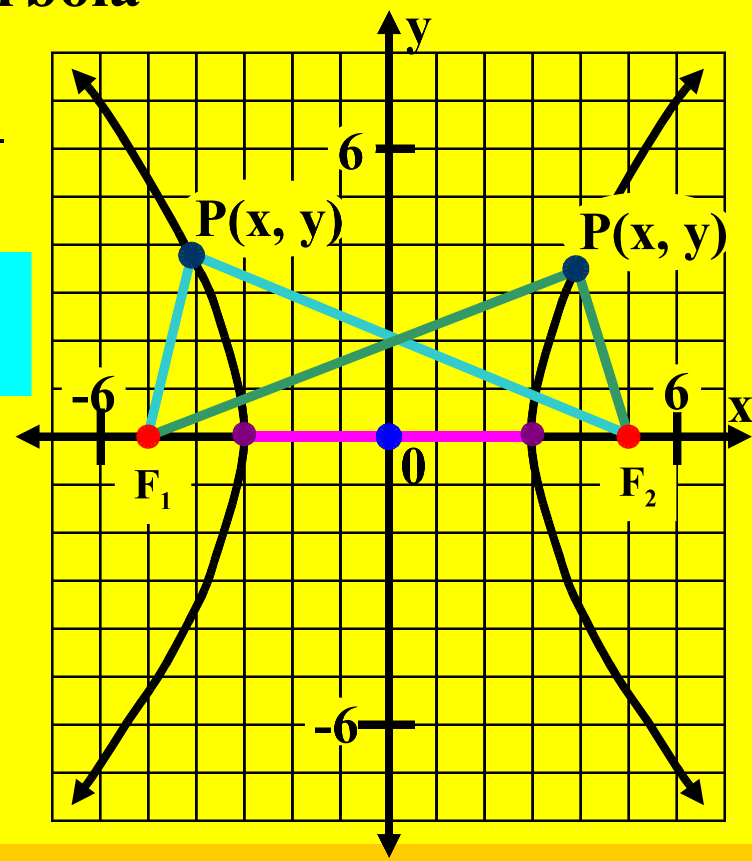
$$25x^2 + 90x + 81 = 9[x^2 + 10x$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$



This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

$$(5x+9)^2 = 9[(x+5)^2 + y^2]$$

$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

This equation is equivalent to

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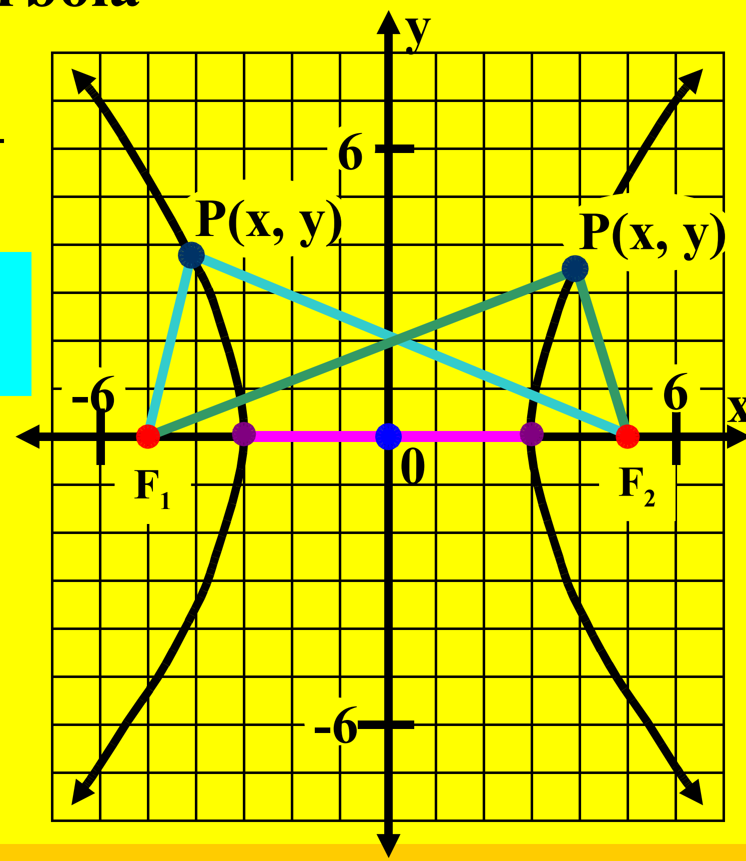


$$(5x+9)^2=9[(x+5)^2+y^2]$$

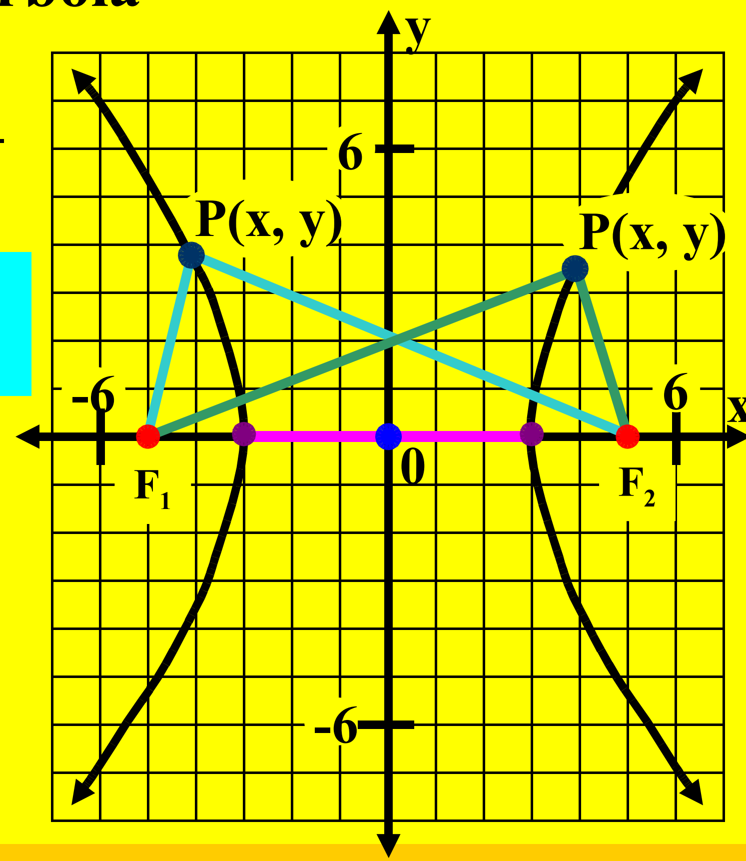
$$25x^2+90x+81=9[x^2+10x+25$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$



This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

Square the binomials.

Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

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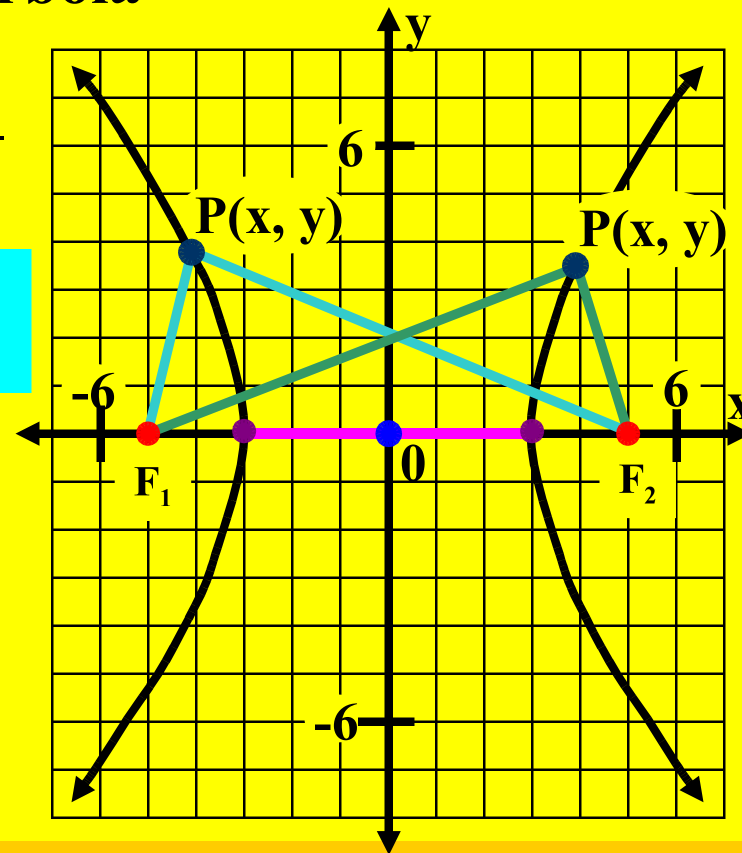

$$(5x + 9)^2 = 9[(x + 5)^2 + y^2]$$

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Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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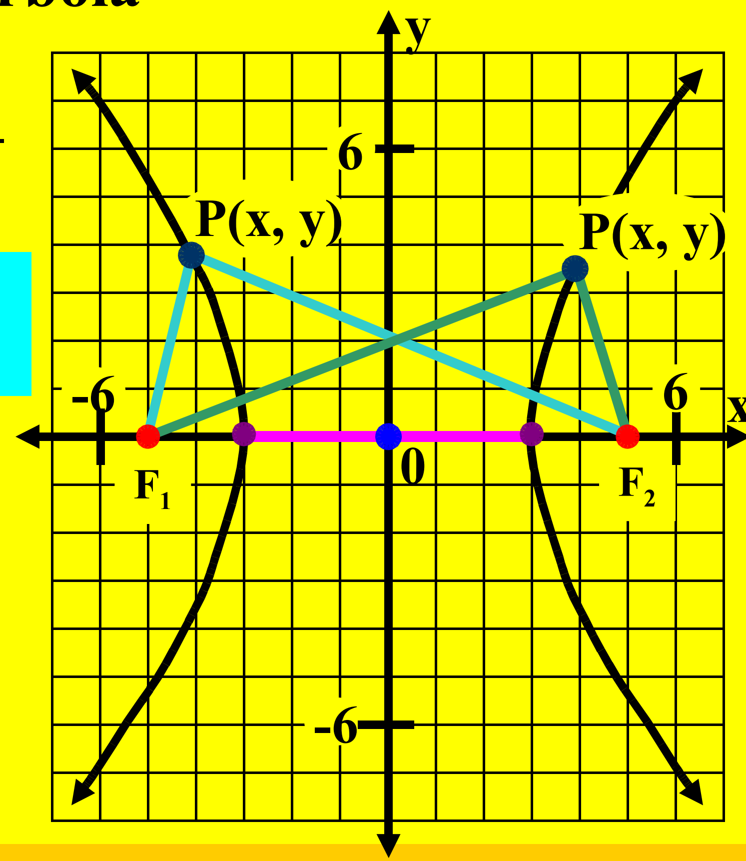


This equation is equivalent to

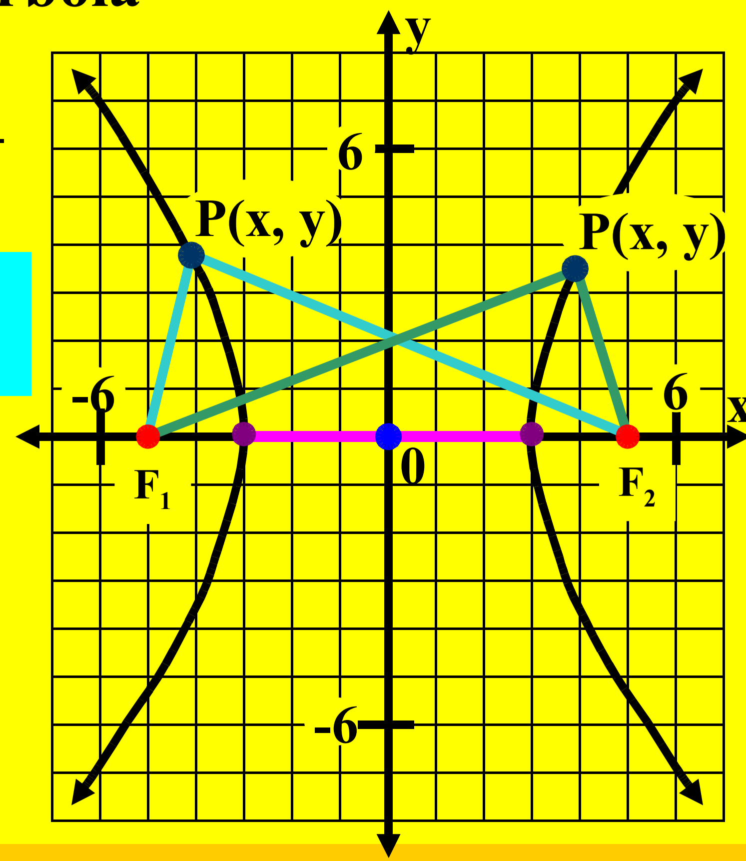
$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$



This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

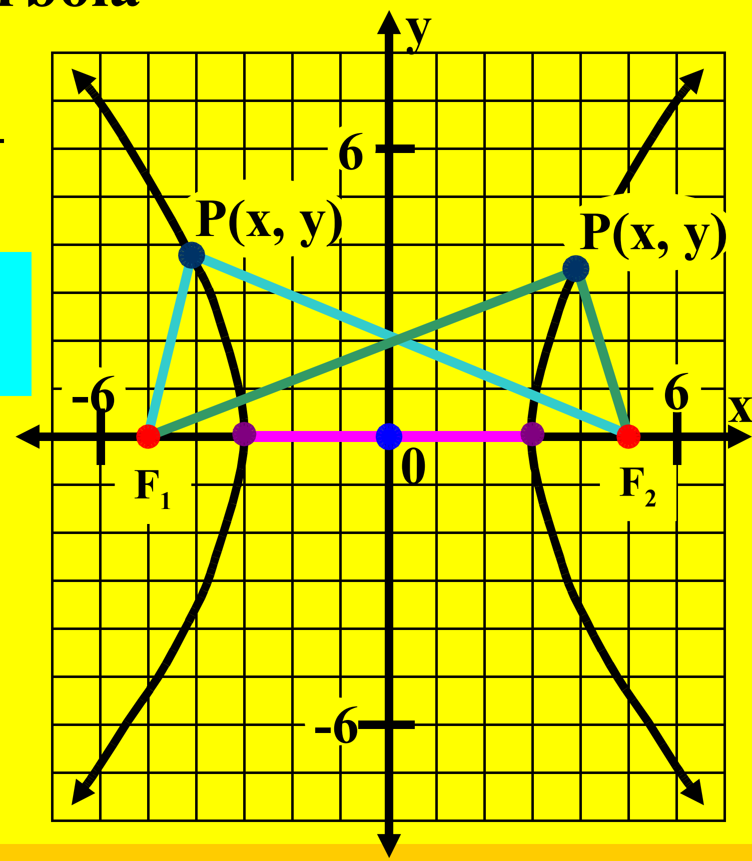
$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

Perform the indicated multiplication.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$



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$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

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Perform the indicated multiplication.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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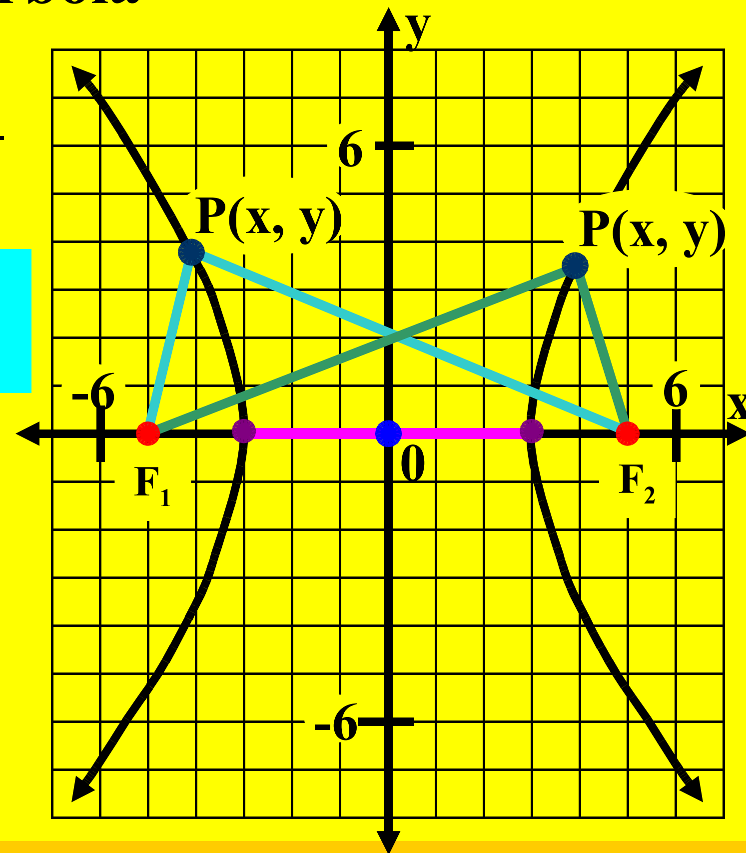


$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

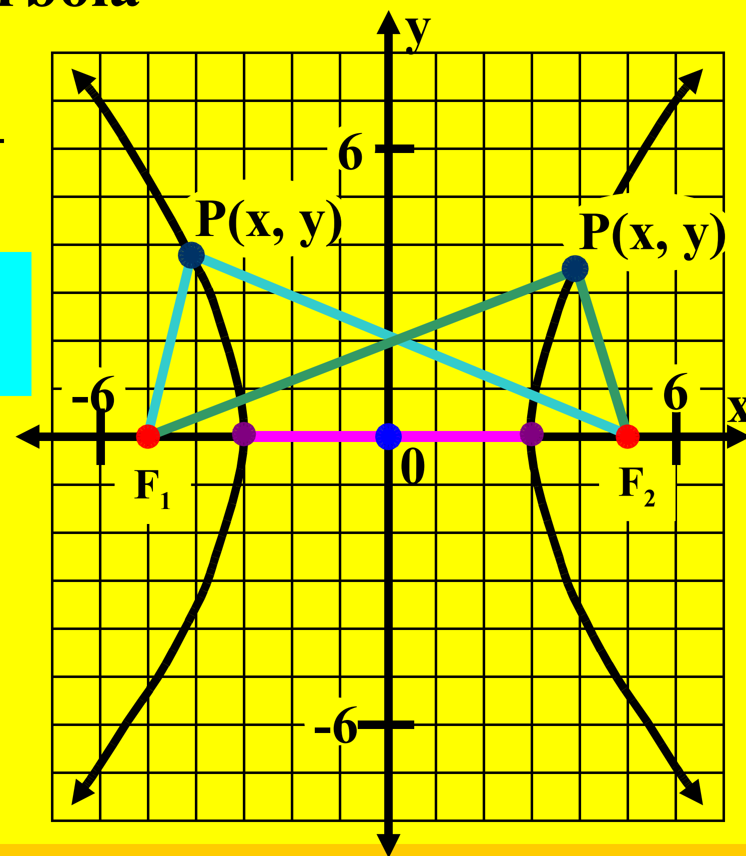
$$25x^2 + 90x + 81 = 9x^2$$

Perform the indicated multiplication.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$



This equation is equivalent to

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

$$25x^2+90x+81=\boxed{9[x^2+10x+25+y^2]}$$

$$25x^2+90x+81=9x^2+90x$$

Perform the indicated multiplication.

Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

This equation is equivalent to

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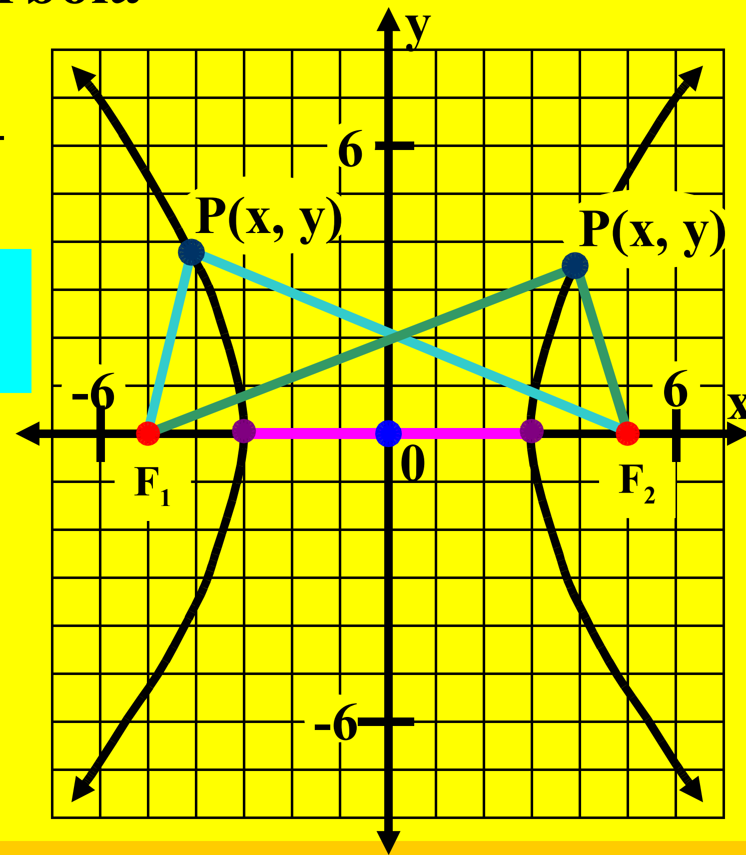


$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225$$

Perform the indicated multiplication.

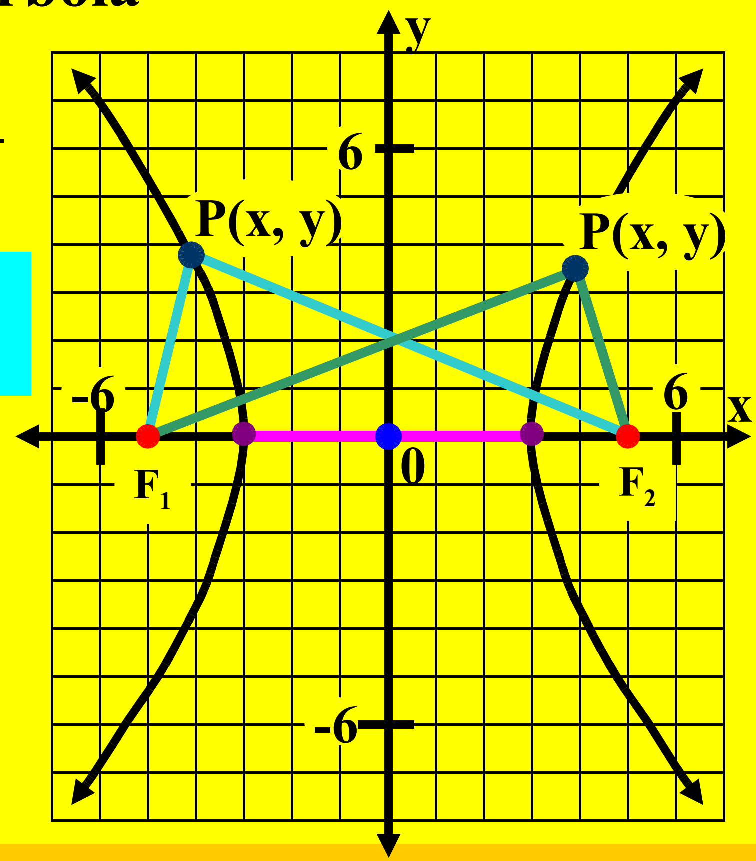
Equations of a Hyperbola

If P(x, y) represents **<u>any point on the hyperbola</u>**, then

$$\sqrt{(x-5)^2 + y^2} - \sqrt{(x+5)^2 + y^2} = \pm 6$$

This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$



$$25x^2 + 90x + 81 = 9[x^2 + 10x + 25 + y^2]$$

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

Perform the indicated multiplication.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

This equation is equivalent to

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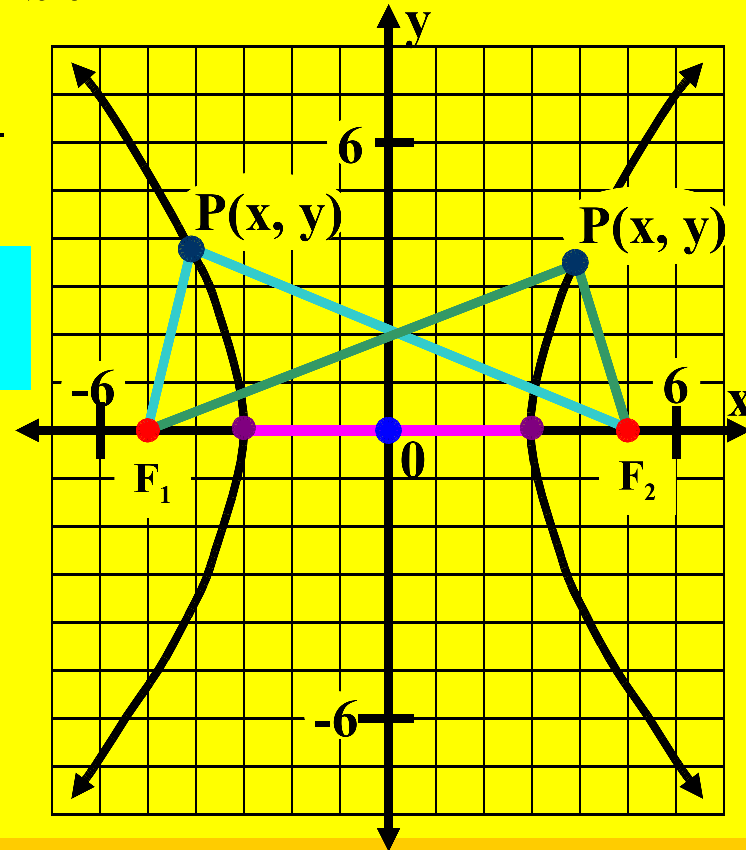

$$25x^2+90x+81=9[x^2+10x+25+y^2]$$

$$25x^2+90x+81=9x^2+90x+225+9y^2$$

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

This equation is equivalent to

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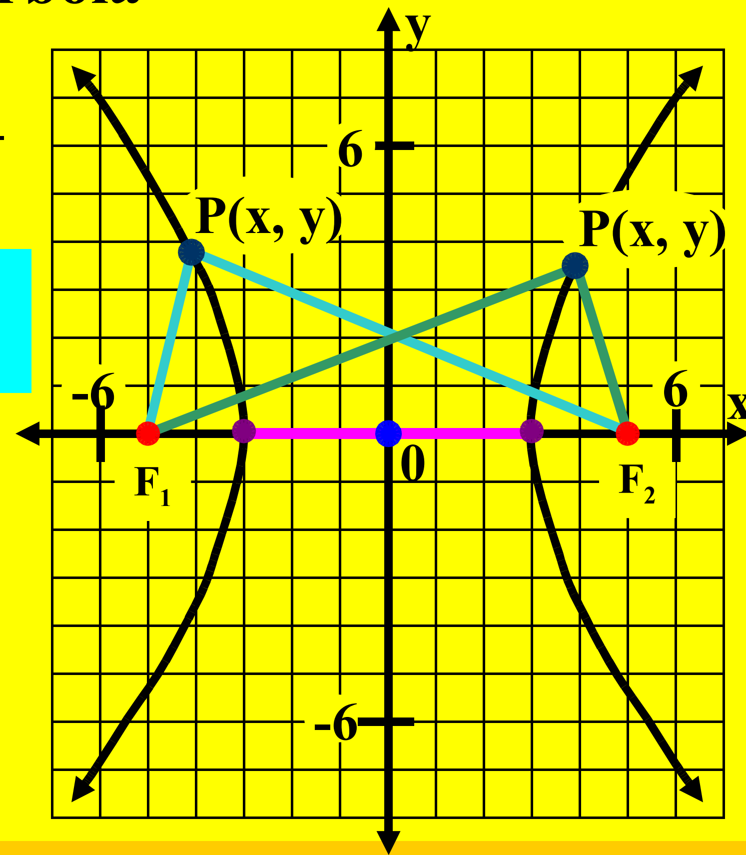

$$25x^2+90x+81=9x^2+90x+225+9y^2$$

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

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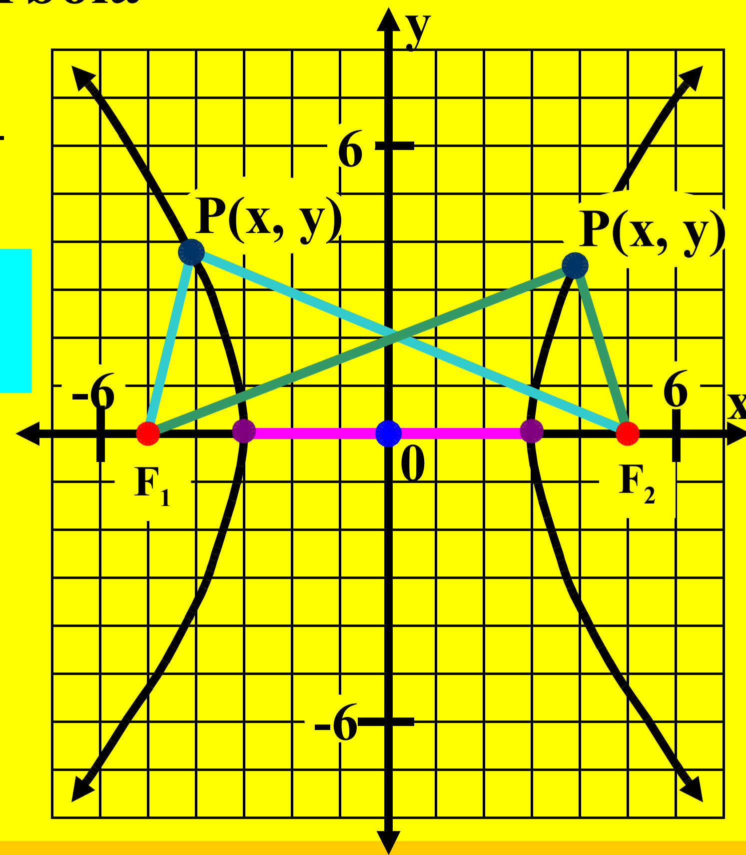

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

Subtract 90x + 81 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

This equation is equivalent to

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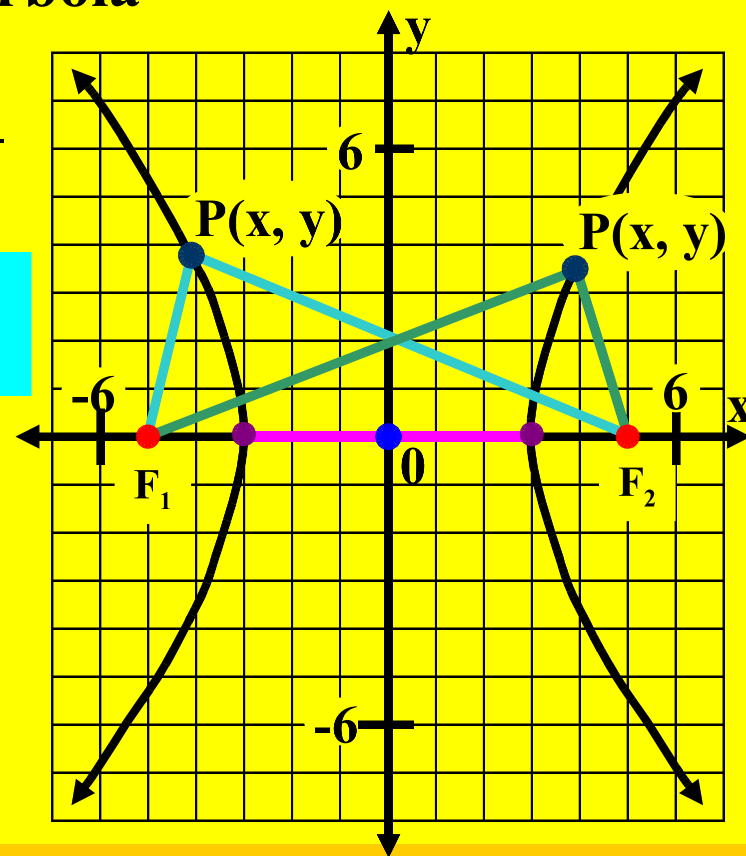

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

$$25x^2$$

Subtract 90x + 81 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

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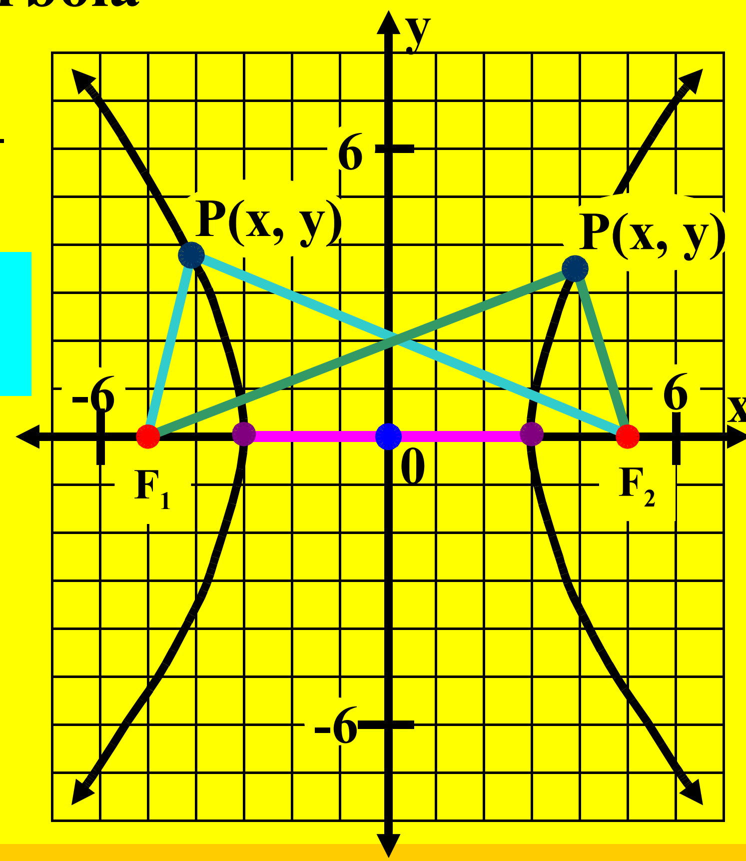

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

$$25x^2 =$$

Subtract 90x + 81 from both sides.

Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

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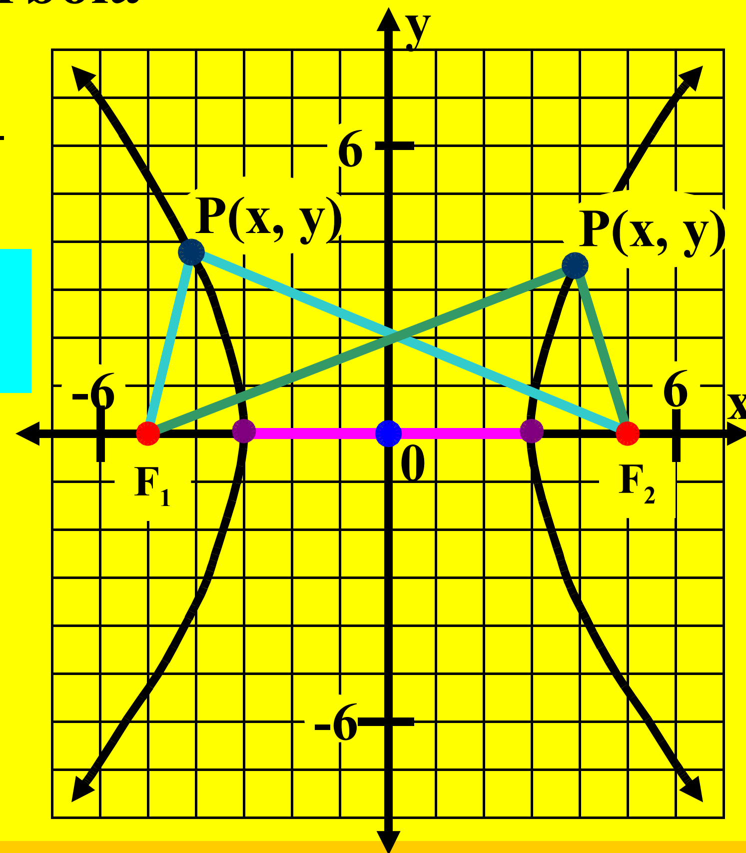

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

$$25x^2 = 9x^2$$

Subtract 90x + 81 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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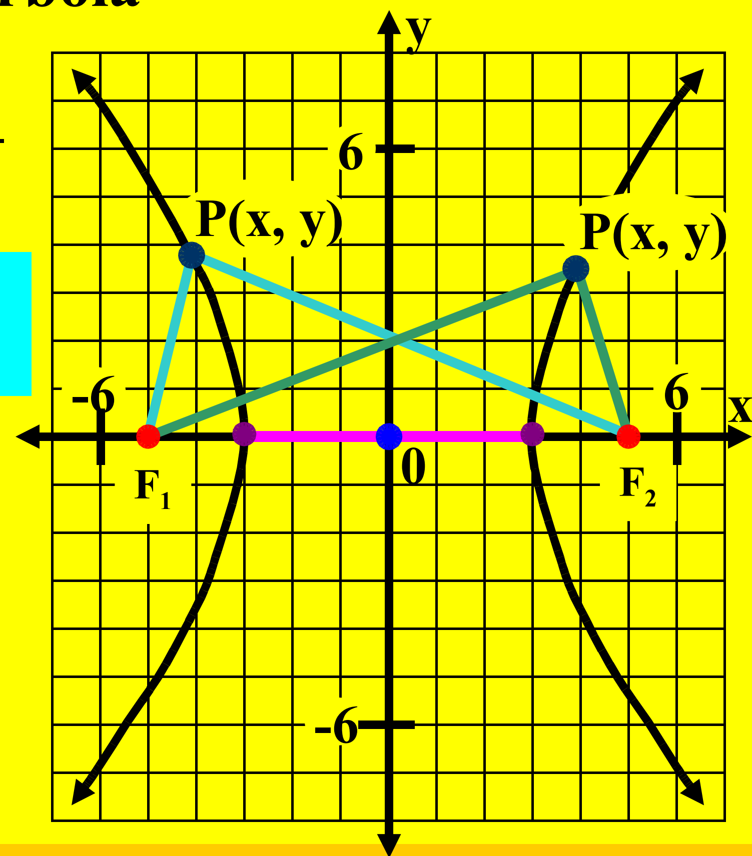

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

$$25x^2 = 9x^2 + 144$$

Subtract 90x + 81 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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This equation is equivalent to

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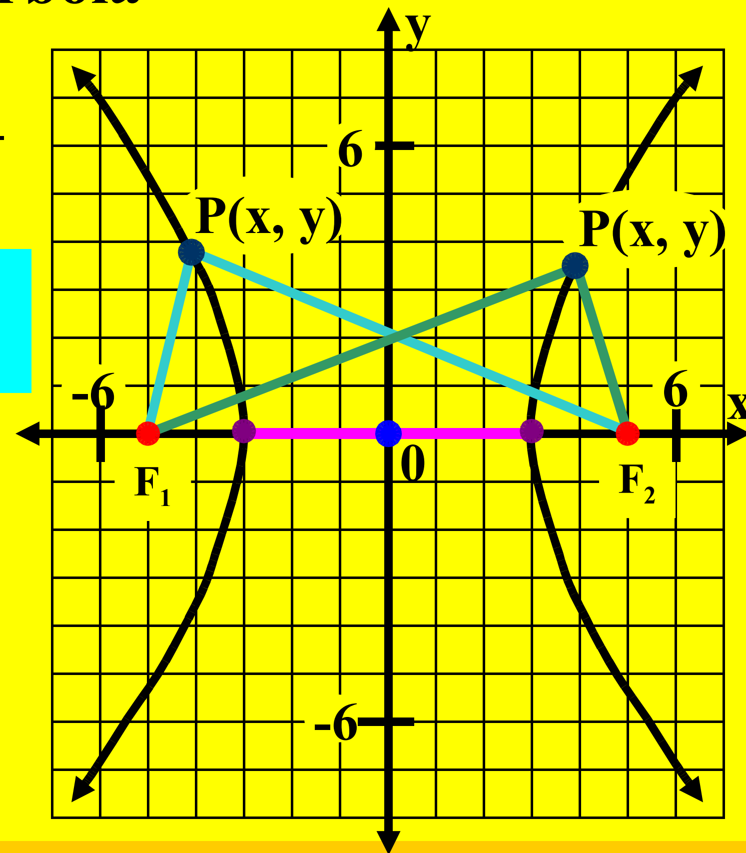

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

$$25x^2 = 9x^2 + 144 + 9y^2$$

Subtract 90x + 81 from both sides.

Equations of a Hyperbola

If P(x, y) represents **<u>any point on the hyperbola</u>**, then

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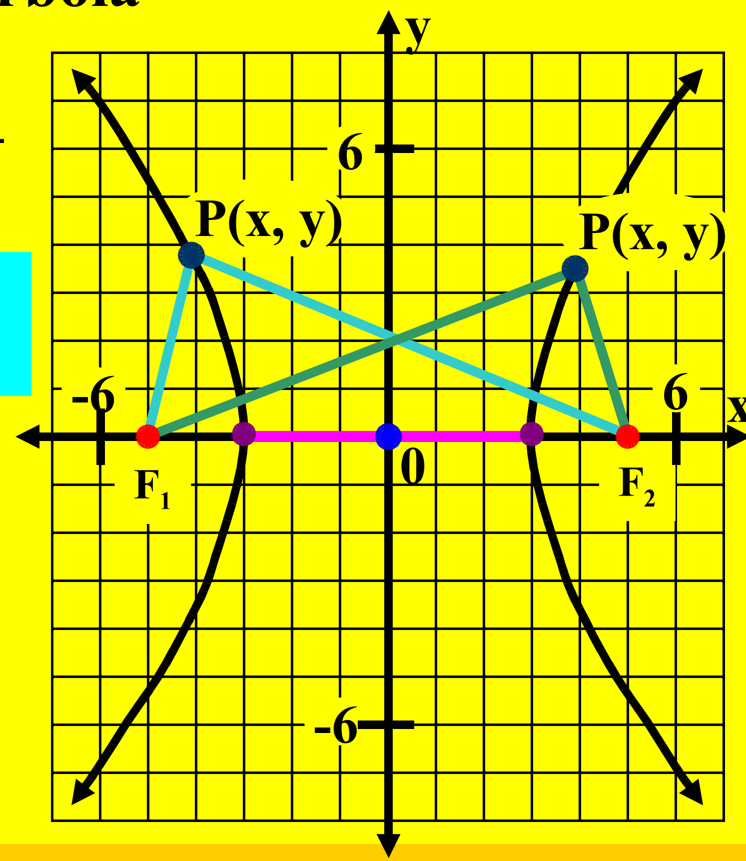


This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

$$25x^2 + 90x + 81 = 9x^2 + 90x + 225 + 9y^2$$

$$25x^2 = 9x^2 + 144 + 9y^2$$

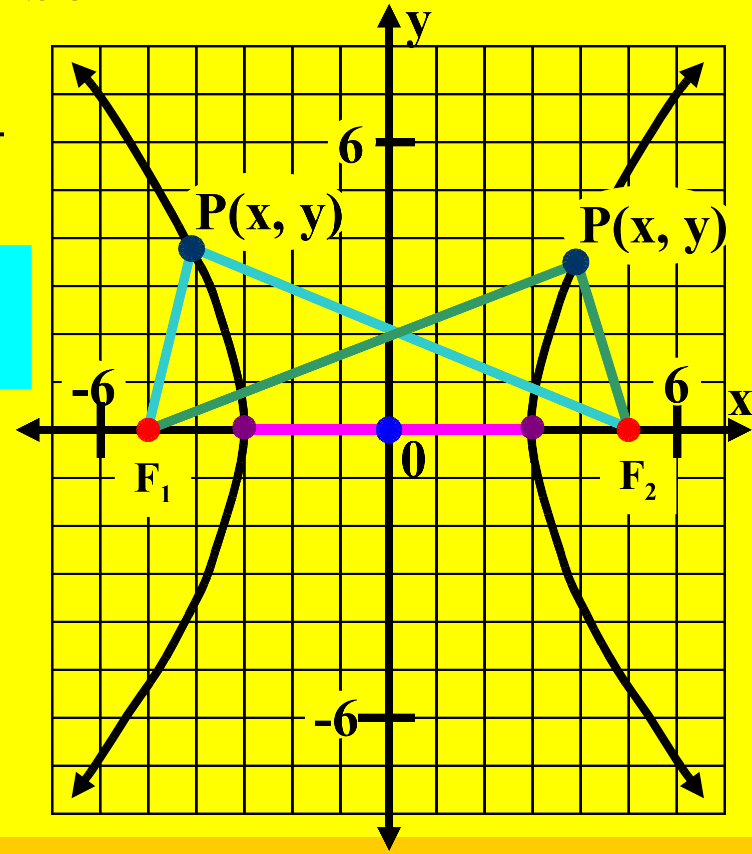
Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

This equation is equivalent to

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$



$$25x^2 = 9x^2 + 144 + 9y^2$$

Equations of a Hyperbola

If P(x, y) represents **<u>any point on the hyperbola</u>**, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

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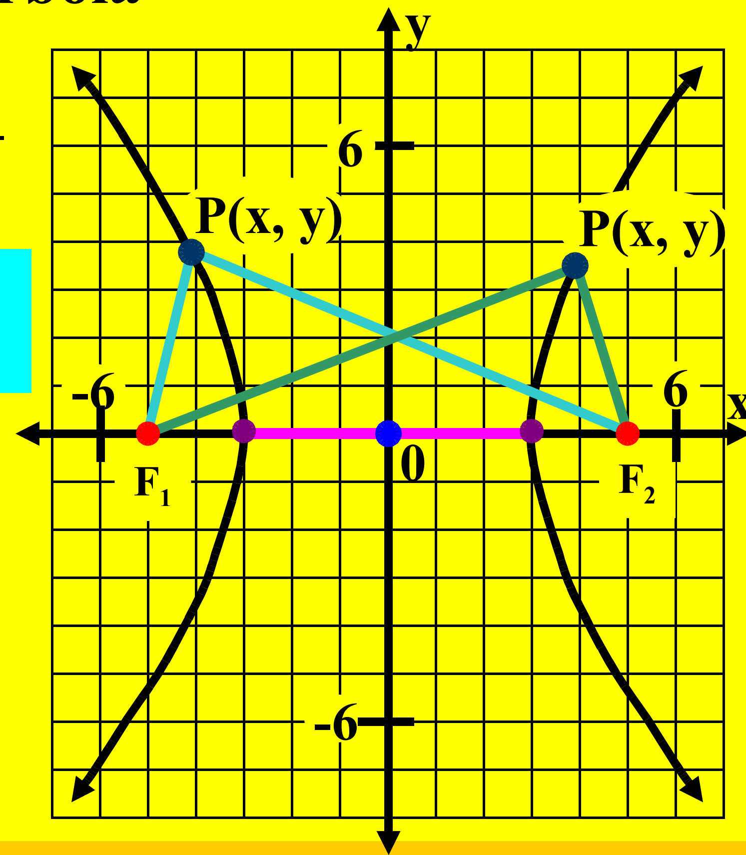


$$25x^2 = 9x^2 + 144 + 9y^2$$

Subtract $9x^2 + 9y^2$ from both sides.

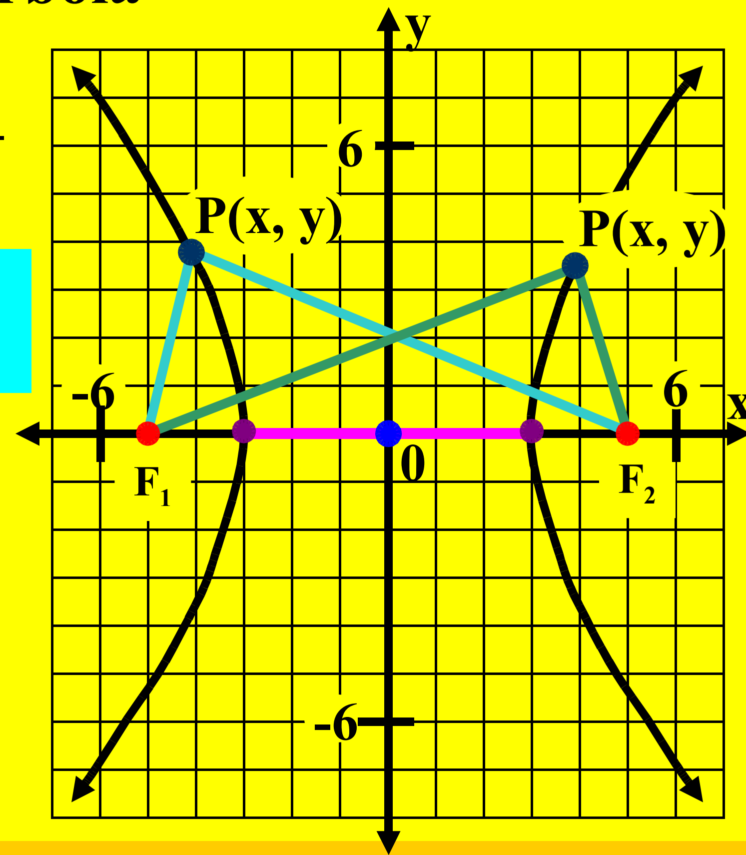
Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2 + y^2} - \sqrt{(x+5)^2 + y^2} = \pm 6$$

This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$



$$25x^2 = 9x^2 + 144 + 9y^2$$

$$16x^2$$

Subtract $9x^2 + 9y^2$ from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

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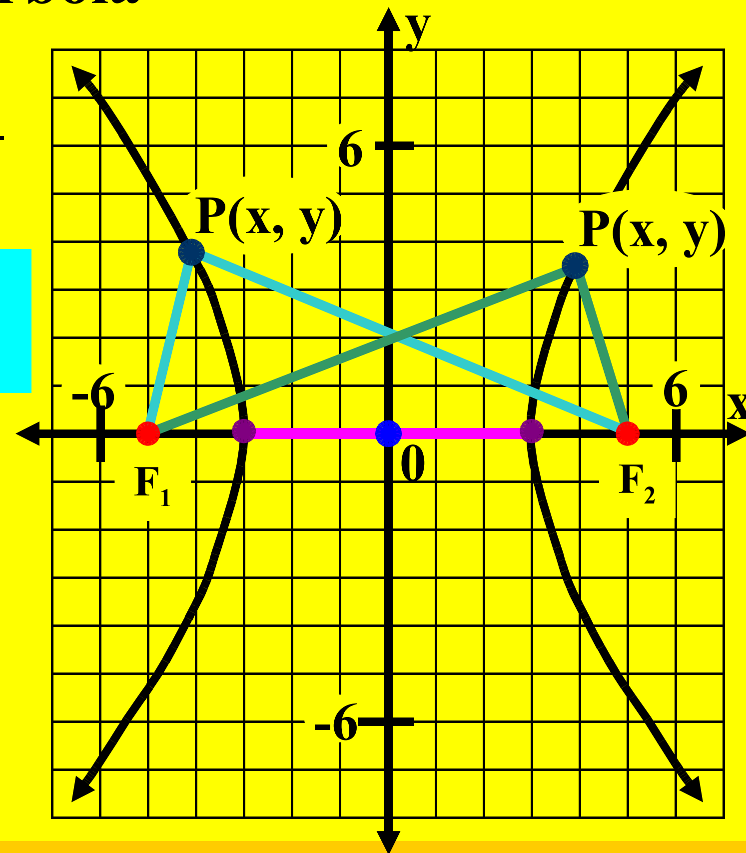

$$25x^2 = 9x^2 + 144 + 9y^2$$

$$16x^2 - 9y^2$$

Subtract $9x^2 + 9y^2$ from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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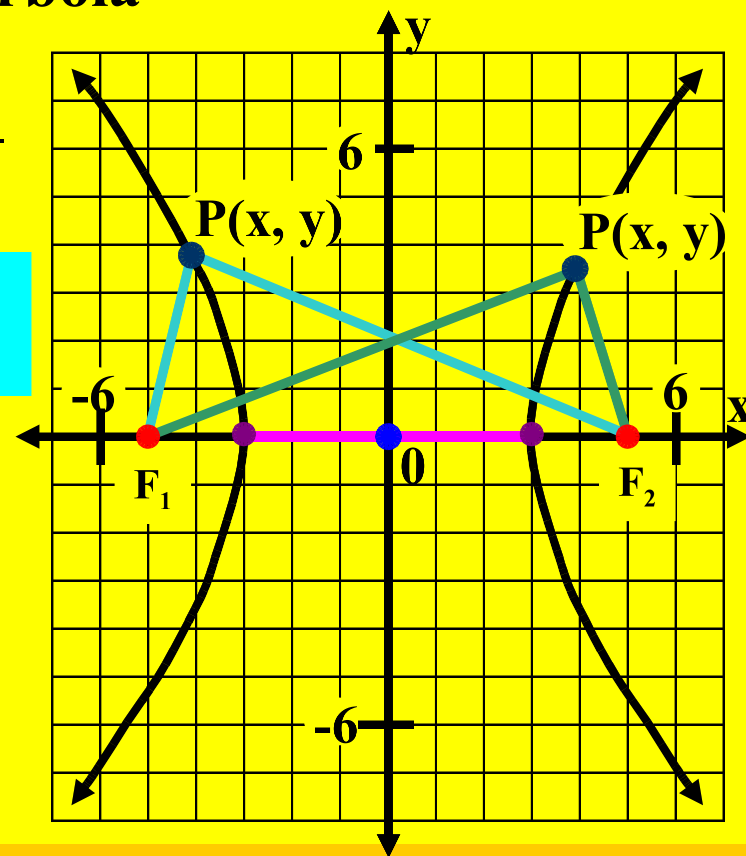

$$25x^2 = 9x^2 + 144 + 9y^2$$

$$16x^2 - 9y^2 =$$

Subtract $9x^2 + 9y^2$ from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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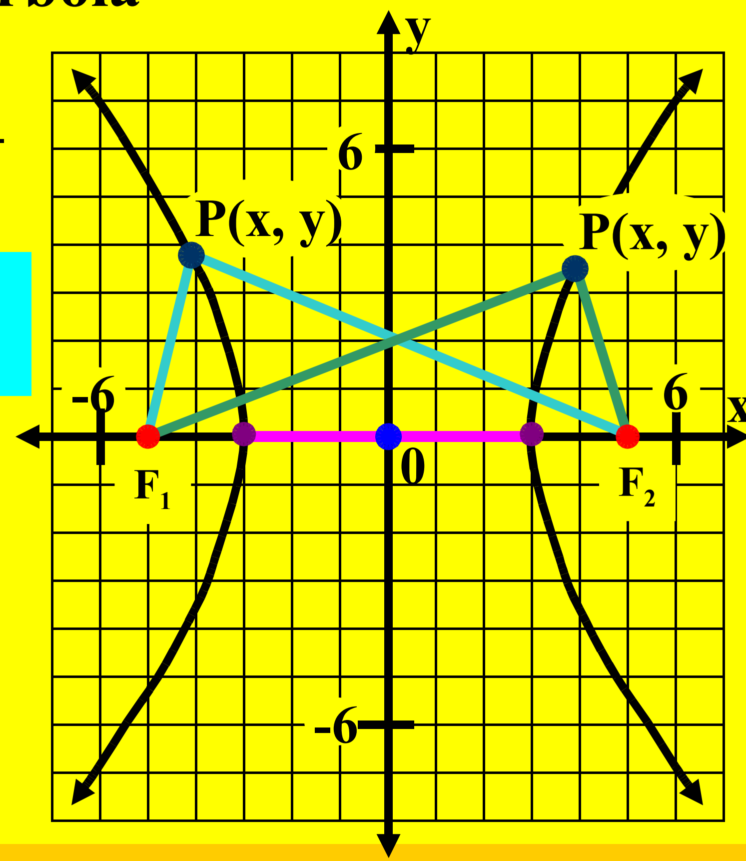

$$25x^2 = 9x^2 + 144 + 9y^2$$

$$16x^2 - 9y^2 = 144$$

Subtract $9x^2 + 9y^2$ from both sides.

Equations of a Hyperbola

If P(x, y) represents **<u>any point on the hyperbola</u>**, then

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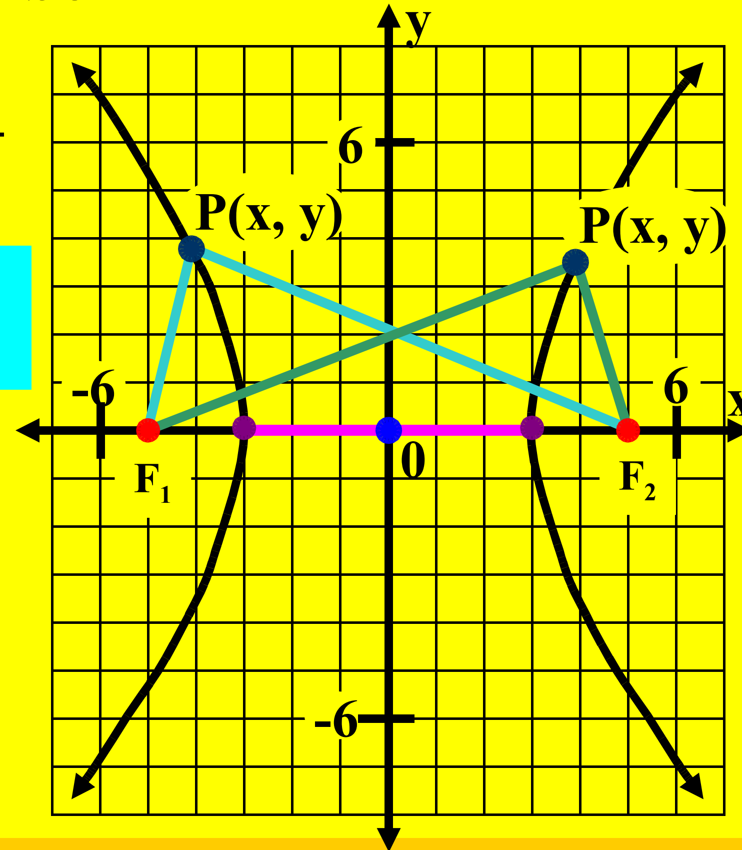


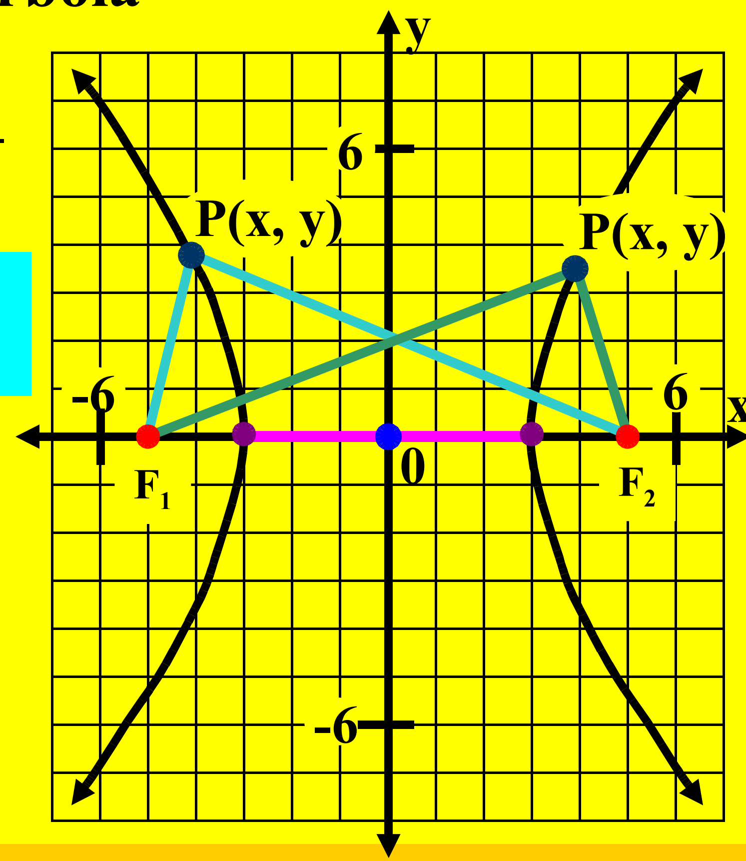
$$25x^2 = 9x^2 + 144 + 9y^2$$

$$16x^2 - 9y^2 = 144$$

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$



This equation is equivalent to

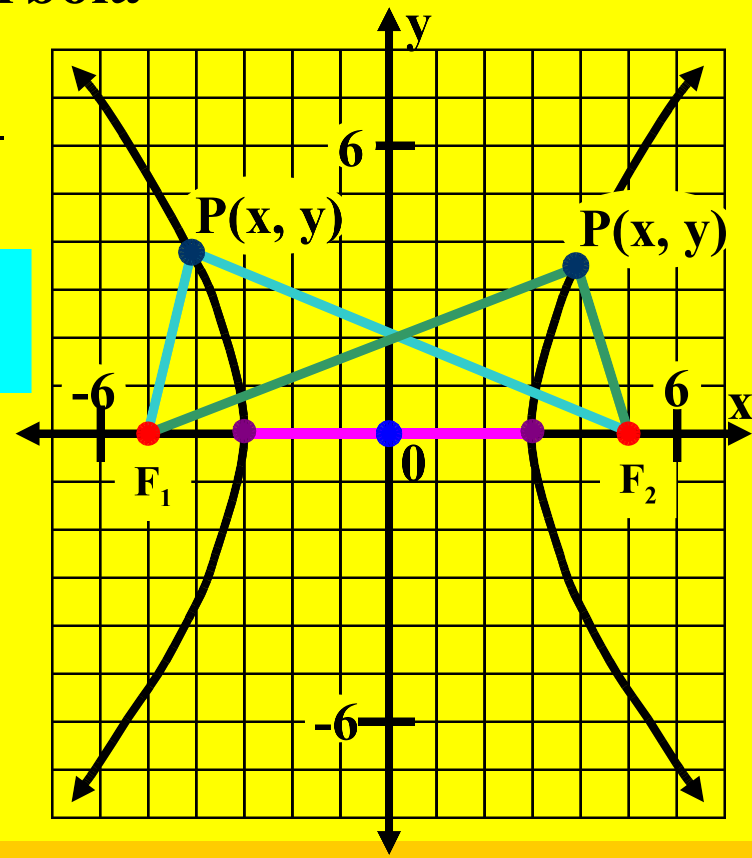
$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

$$16x^2-9y^2=144$$

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$



This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

$$16x^2 - 9y^2 = 144$$

Divide both sides by 144 and reduce to lowest terms.

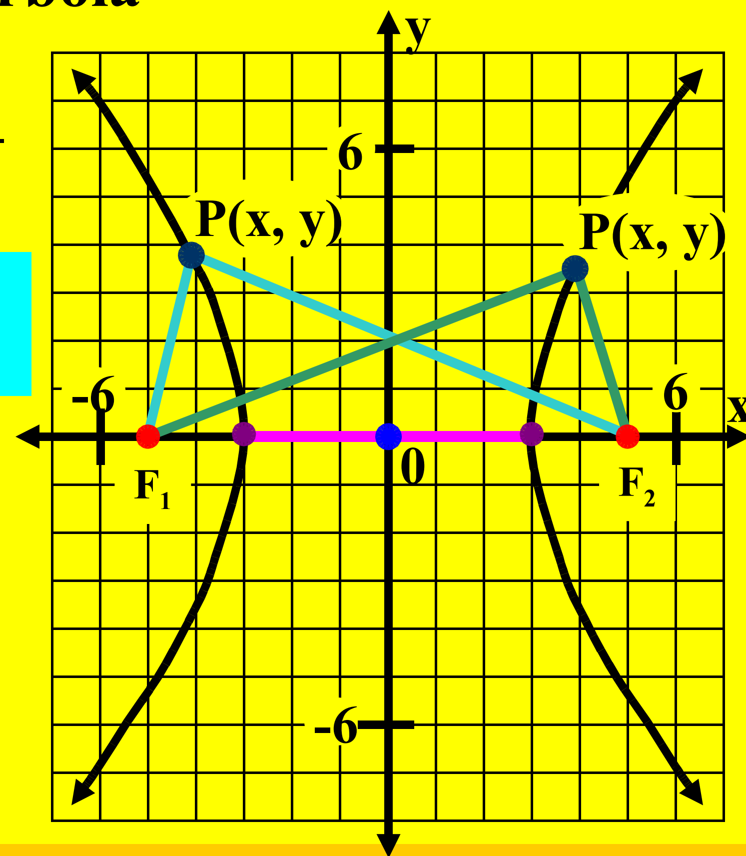
Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$



$$\frac{16x^2}{144} - \frac{9y^2}{144} = \frac{144}{144}$$

Divide both sides by 144 and reduce to lowest terms.

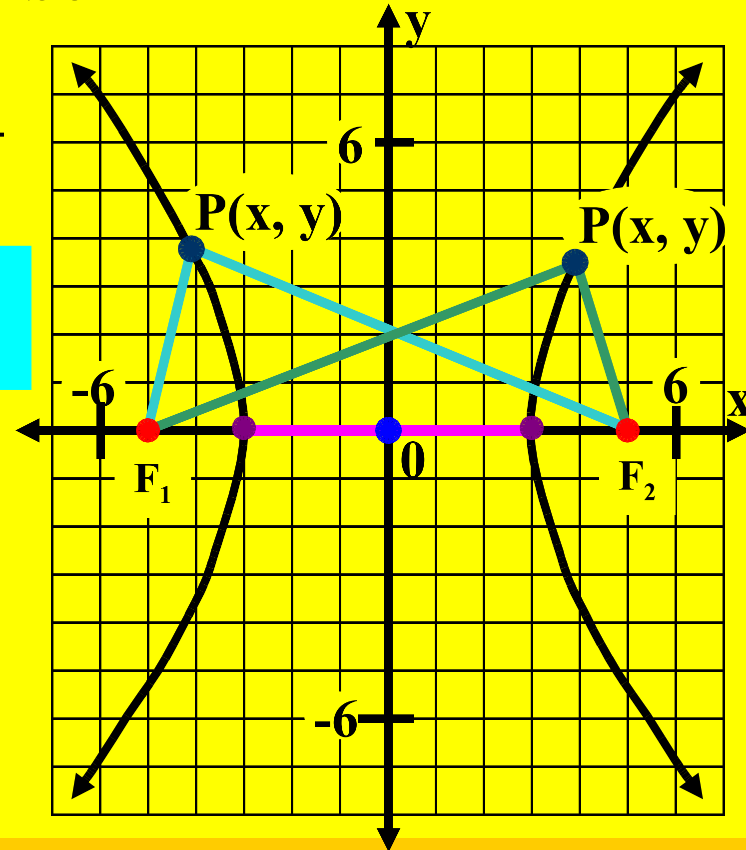
Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

This equation is equivalent to

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$



$$\frac{16x^2}{144}-\frac{9y^2}{144}=\frac{144}{144}$$

$$\frac{x^2}{9}$$

Divide both sides by 144 and reduce to lowest terms.

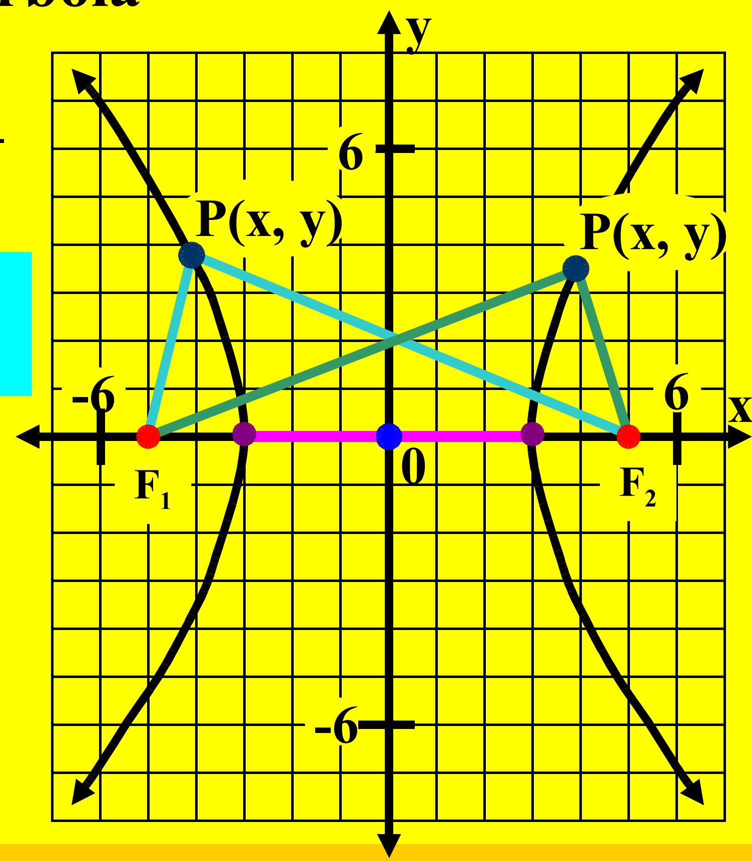
Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

$$\sqrt{(x-5)^2 + y^2} - \sqrt{(x+5)^2 + y^2} = \pm 6$$

This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$



$$\frac{16x^2}{144} - \frac{9y^2}{144} = \frac{144}{144}$$

$$\frac{x^2}{9} -$$

Divide both sides by 144 and reduce to lowest terms.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

This equation is equivalent to

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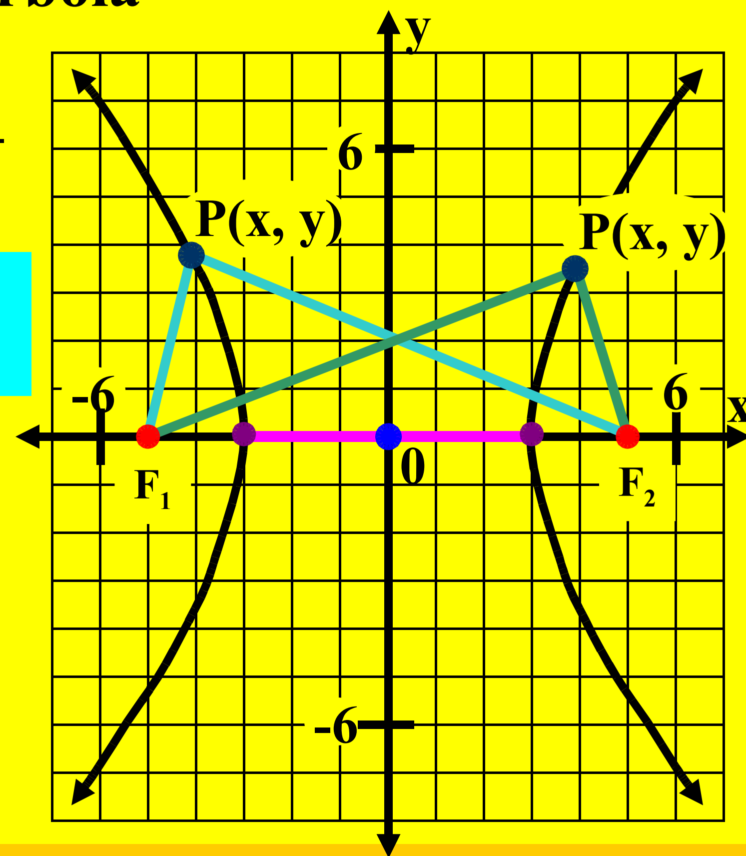

$$\frac{16x^2}{144} - \frac{9y^2}{144} = \frac{144}{144}$$

$$\frac{x^2}{9} - \frac{y^2}{16}$$

Divide both sides by 144 and reduce to lowest terms.

Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

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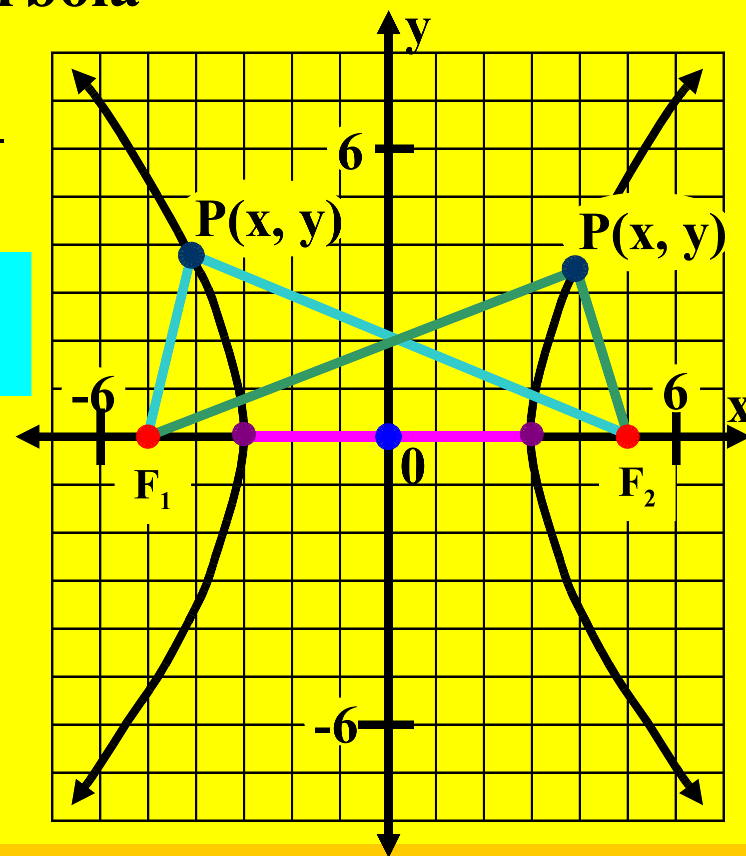

$$\frac{16x^2}{144}-\frac{9y^2}{144}=\frac{144}{144}$$

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Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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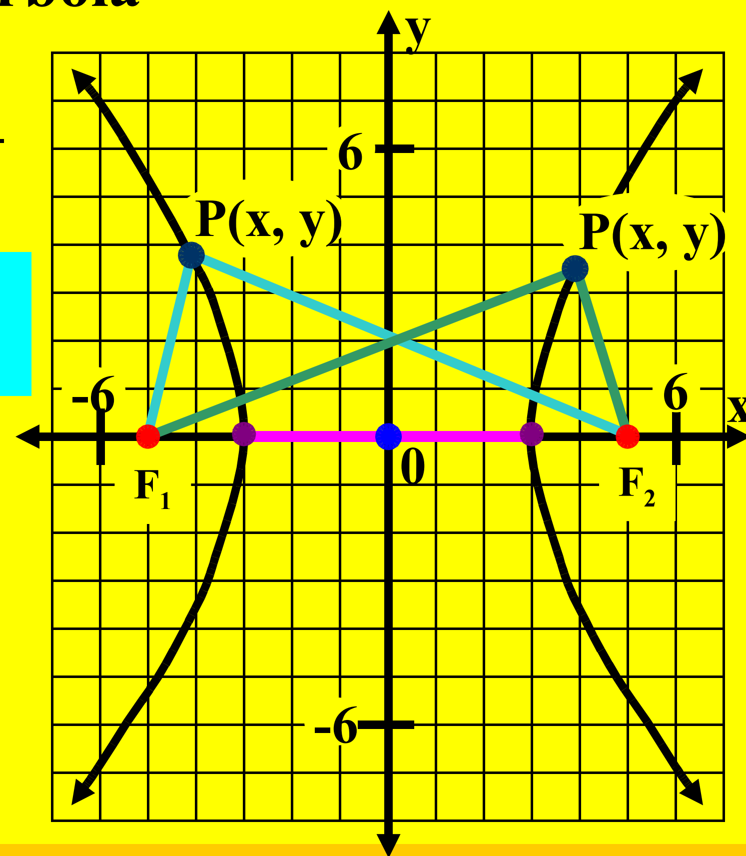

This equation is equivalent to

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

$$\frac{16x^2}{144}-\frac{9y^2}{144}=\frac{144}{144}$$

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

Divide both sides by 144 and reduce to lowest terms.

Equations of a Hyperbola

If P(x, y) represents **any point on the hyperbola**, then

$$\sqrt{(x-5)^2+y^2}-\sqrt{(x+5)^2+y^2}=\pm 6$$

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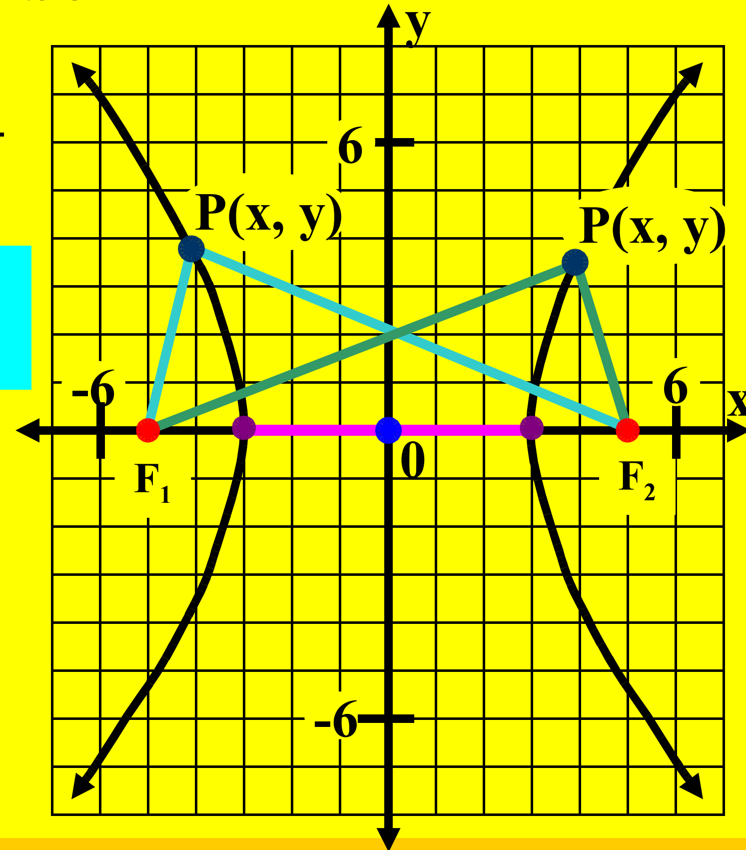


$$\frac{16x^2}{144}-\frac{9y^2}{144}=\frac{144}{144}$$

$$\frac{x^2}{9}-\frac{y^2}{16}=1$$

Equations of a Hyperbola

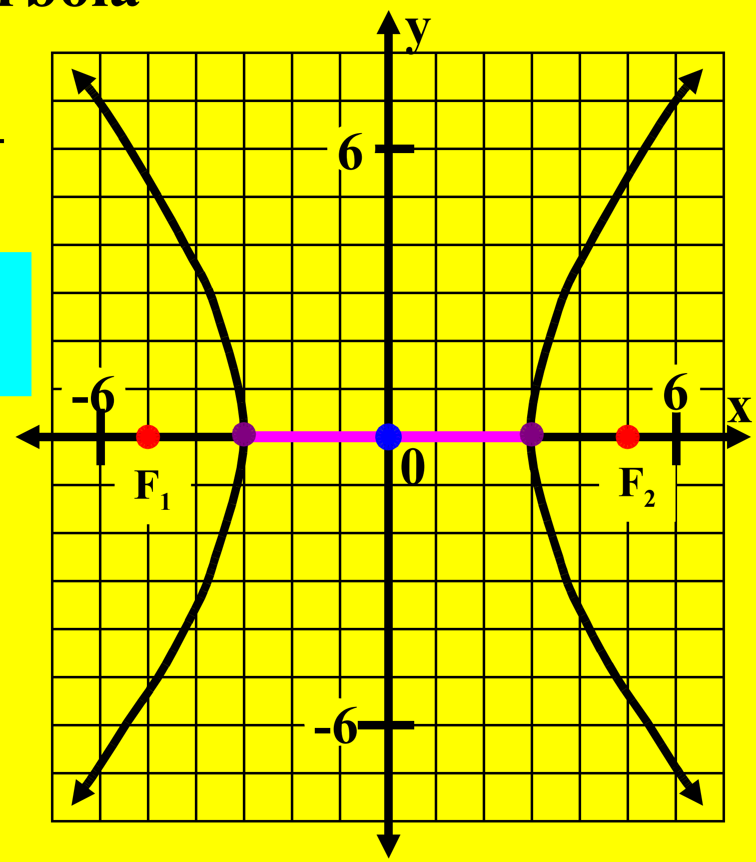
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\sqrt{(x-5)^2+y^2} - \sqrt{(x+5)^2+y^2} = \pm 6$$

This equation is equivalent to

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

This is the standard form equation of this hyperbola.

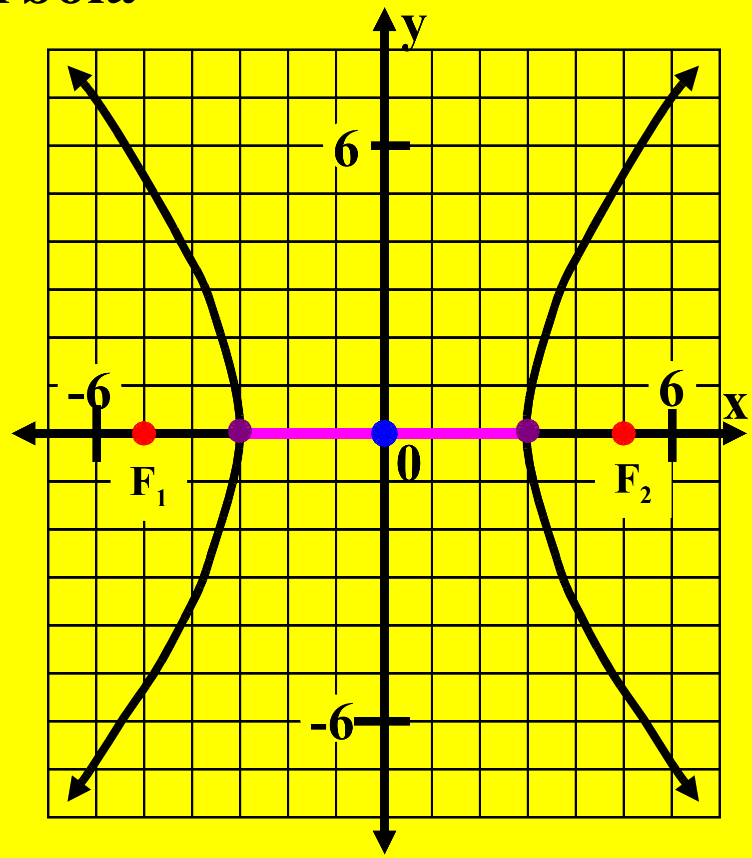


Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Equations of a Hyperbola

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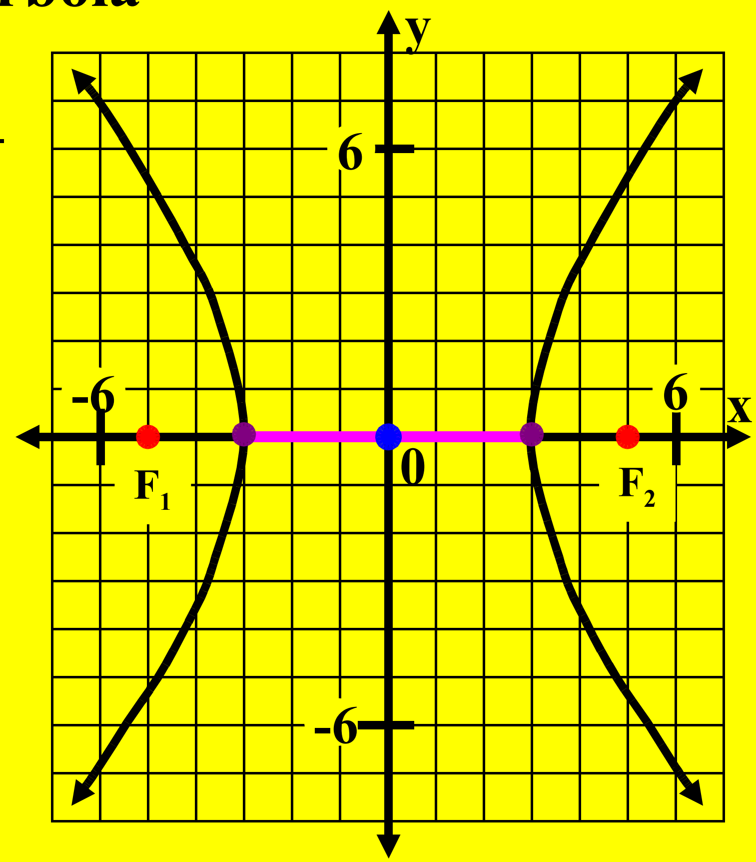
Standard Form Equation



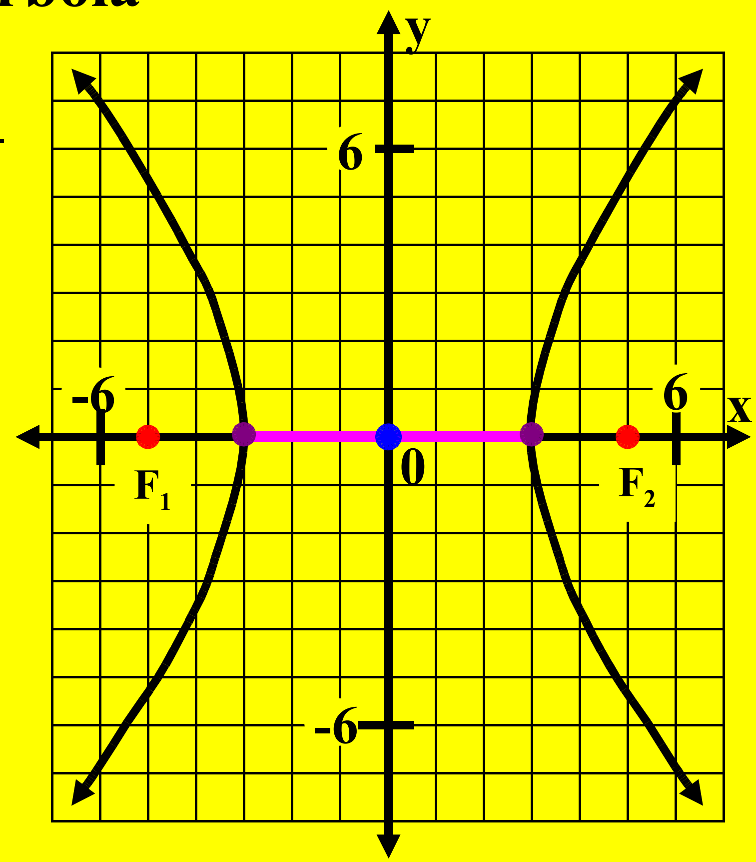
Consider these equations which are equivalent to the standard form equation.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

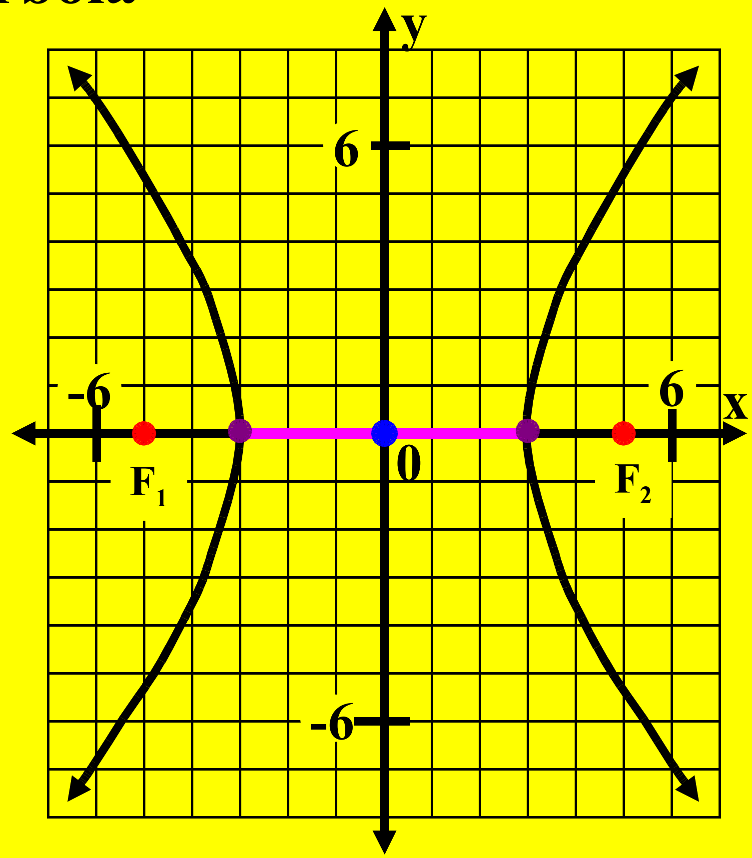
Multiply both sides by 144 (which is 9 times 16).

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

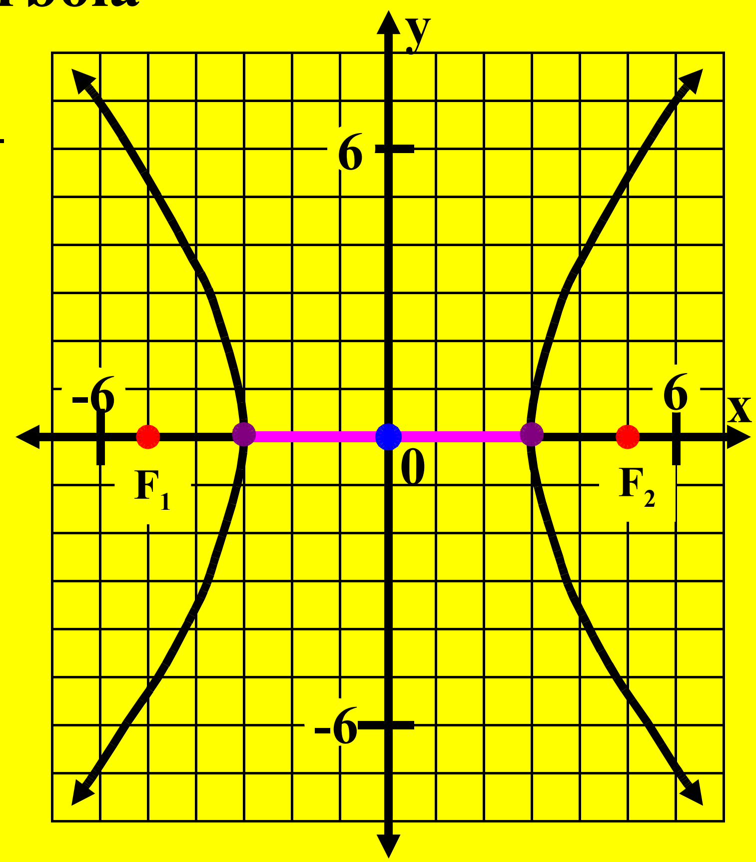


Consider these equations which are equivalent to the standard form equation.

$16x^2$

Multiply both sides by 144 (which is 9 times 16).

Equations of a Hyperbola



If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

Consider these equations which are equivalent to the standard form equation.

$16x^2$ –

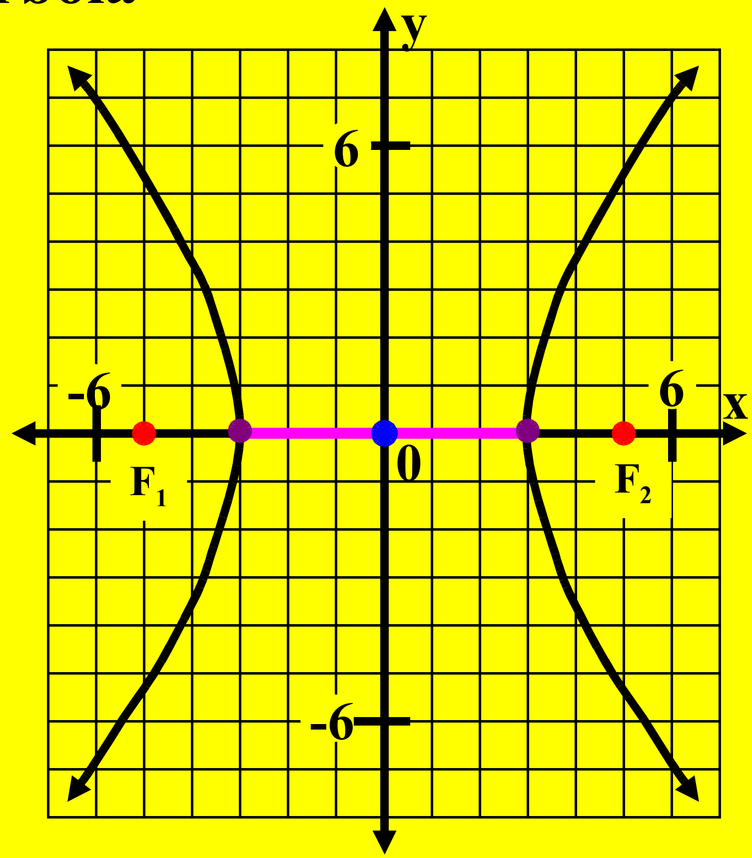
Multiply both sides by 144 (which is 9 times 16).

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$16x^2 - 9y^2$

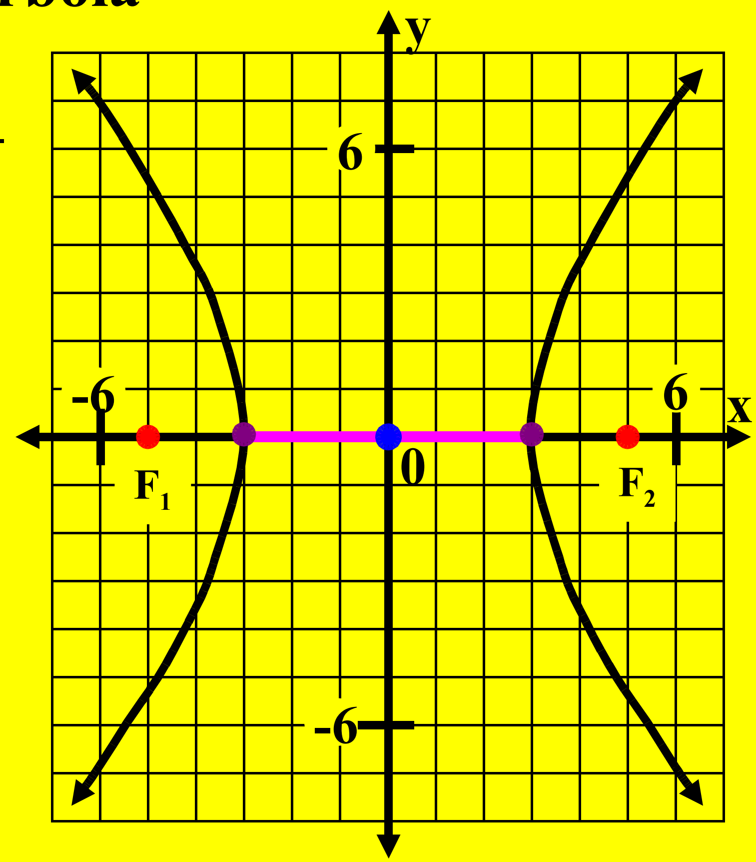
Multiply both sides by 144 (which is 9 times 16).

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$$16x^2 - 9y^2 =$$

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Equations of a Hyperbola

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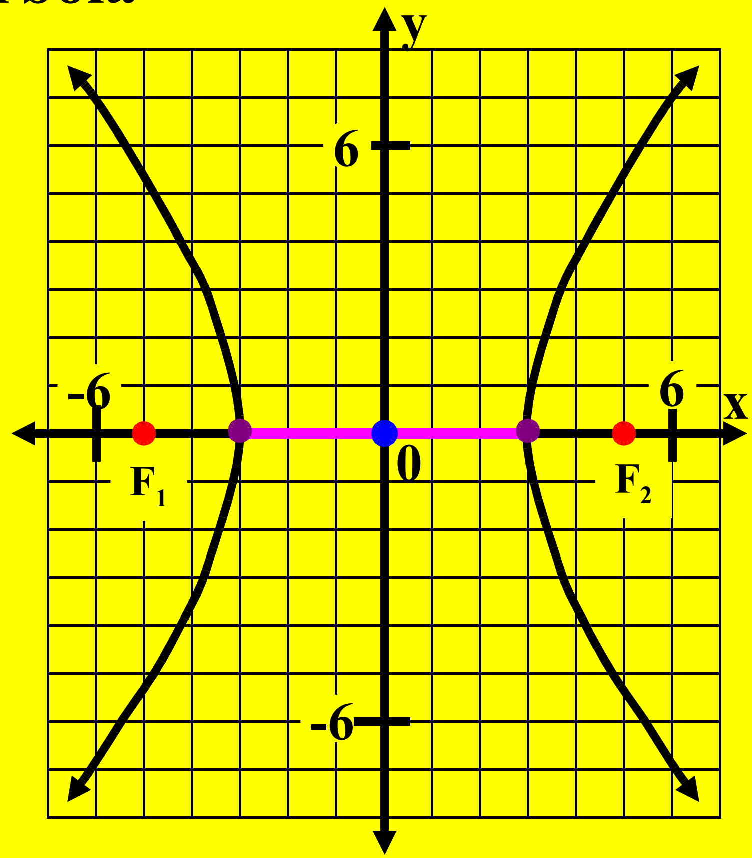
Standard Form Equation



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Equations of a Hyperbola

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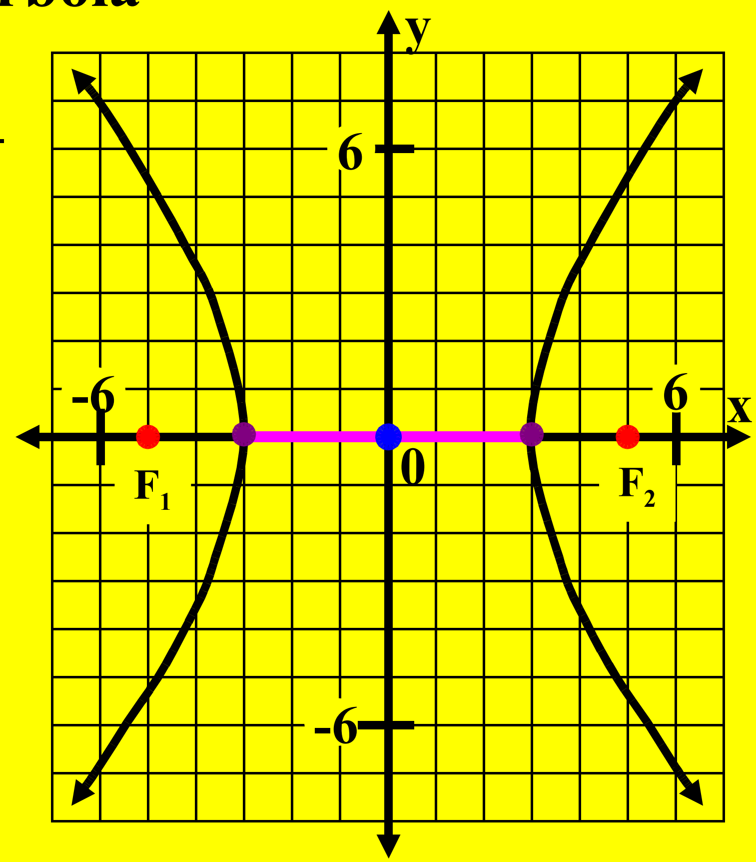

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Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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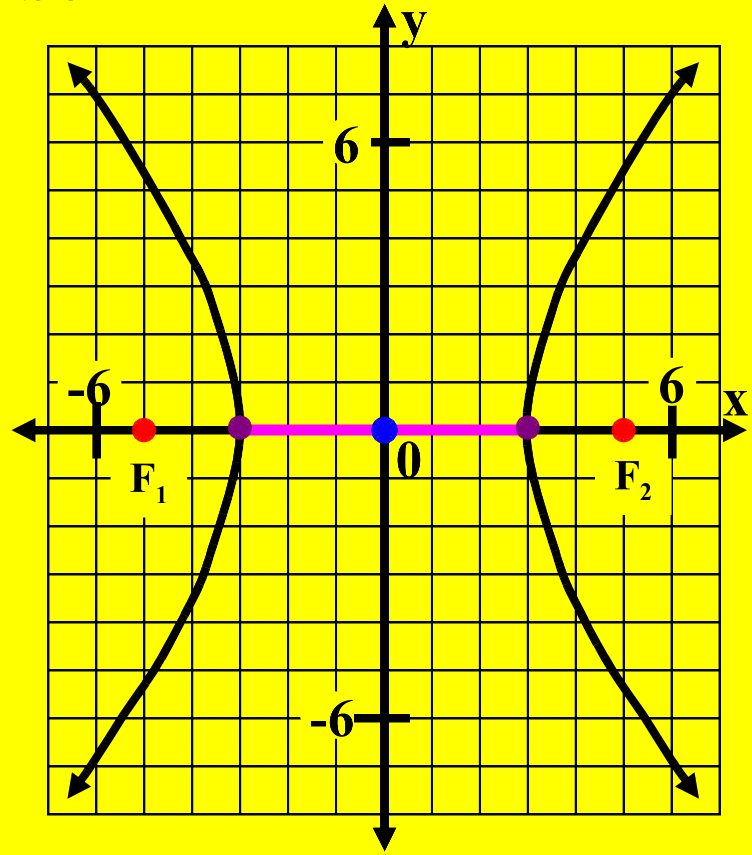


Consider these equations which are equivalent to the standard form equation.

$$16x^2 – 9y^2 = 144$$

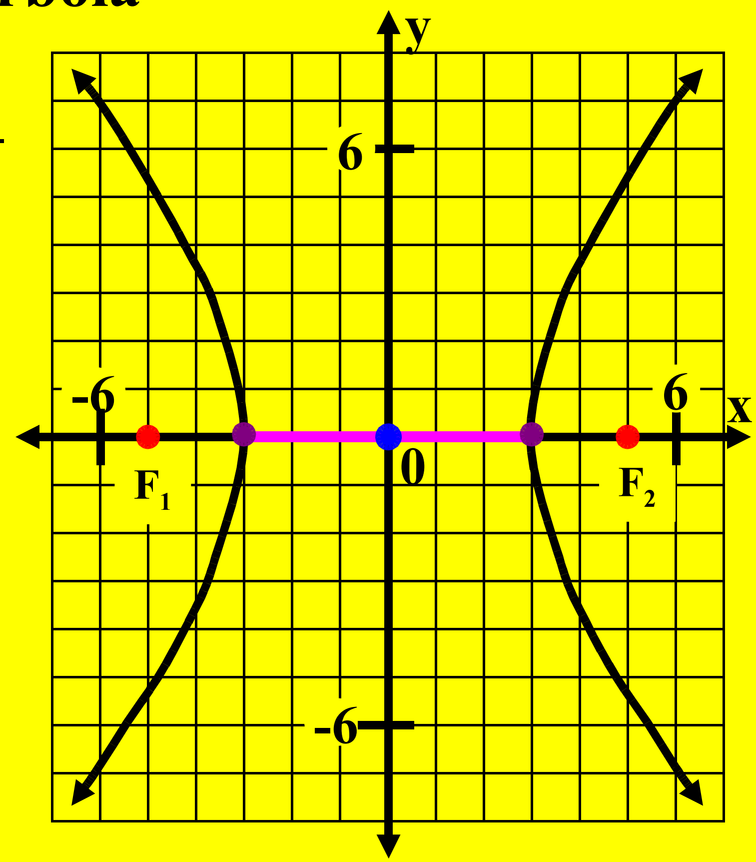
Subtract 144 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



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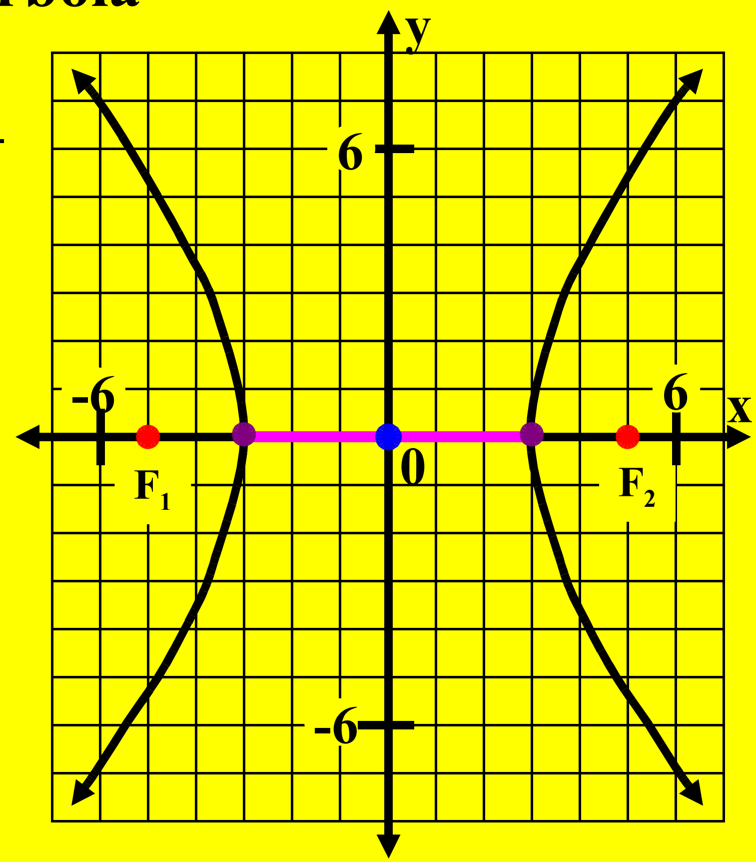


Consider these equations which are equivalent to the standard form equation.

$$16x^2 - 9y^2 = 144$$

$$16x^2 - 9y^2$$

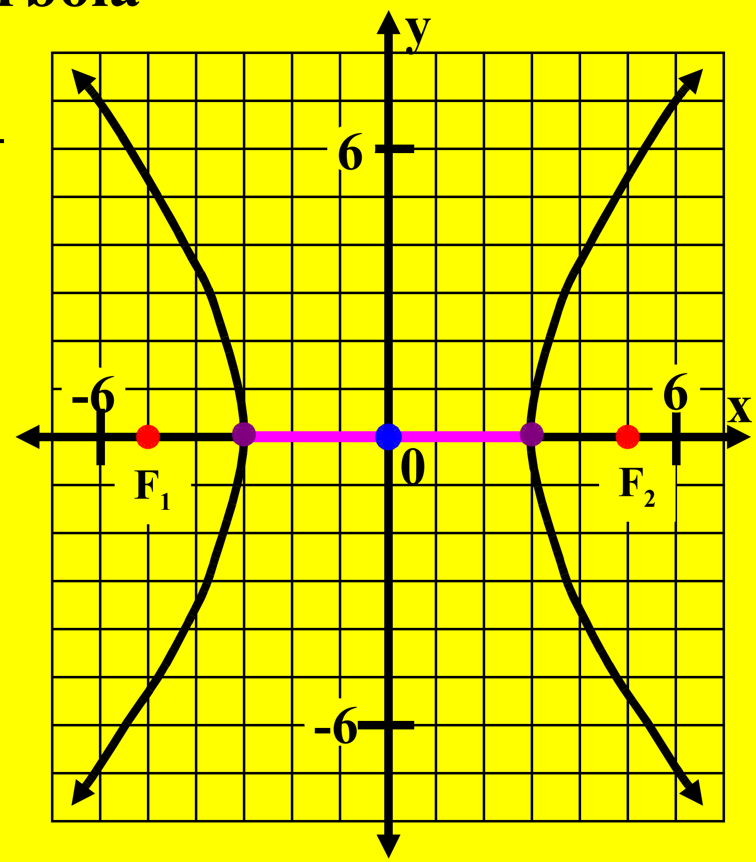
Subtract 144 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$$16x^2 - 9y^2 = 144$$

$$16x^2 - 9y^2 - 144$$

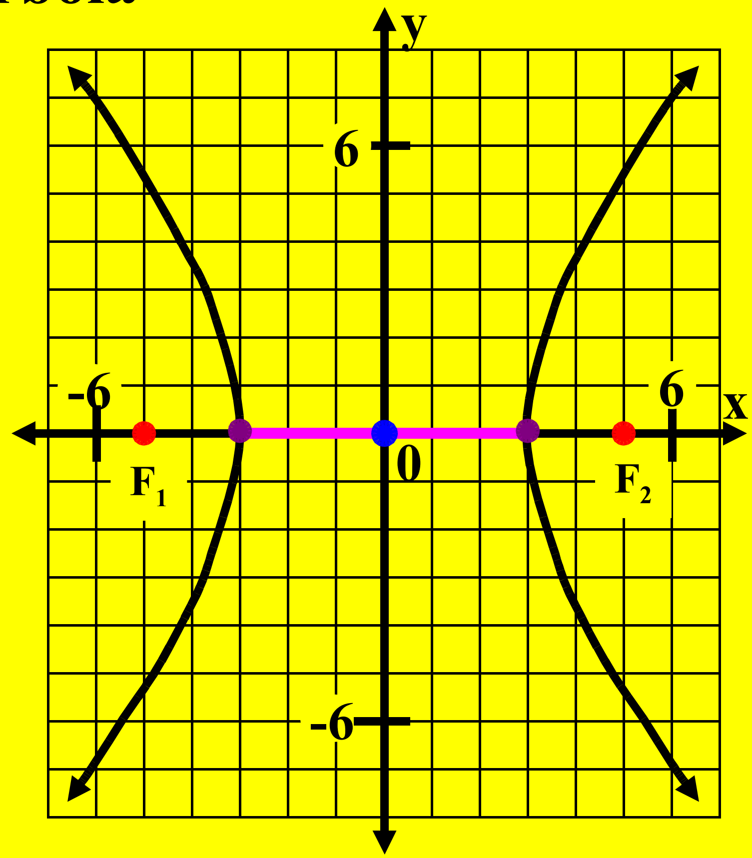
Subtract 144 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$$16x^2 - 9y^2 = 144$$

$$16x^2 - 9y^2 - 144 =$$

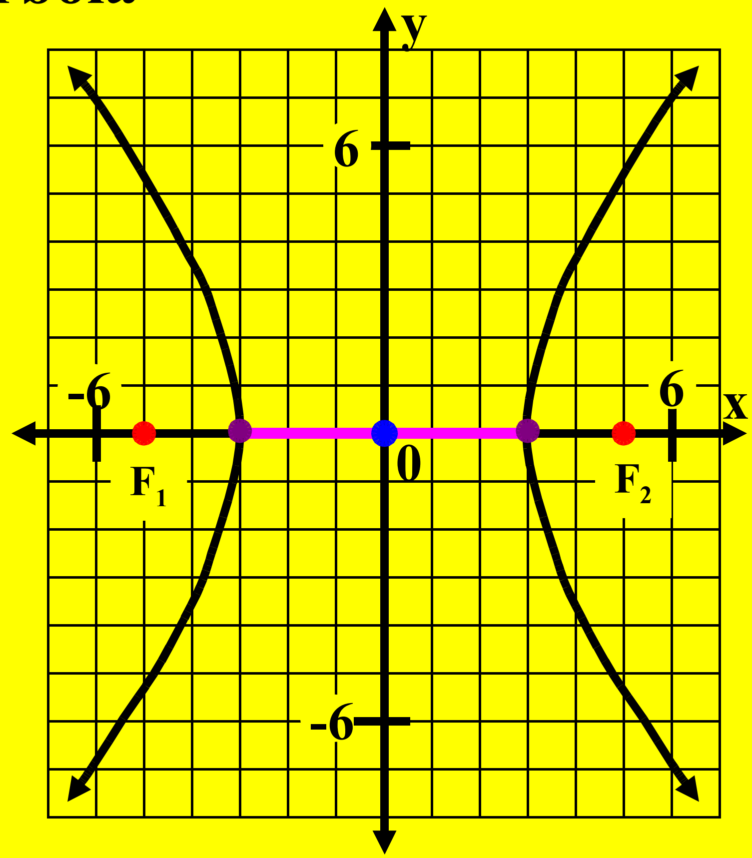
Subtract 144 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$$16x^2 – 9y^2 = 144$$

$$16x^2 – 9y^2 – 144 = 0$$

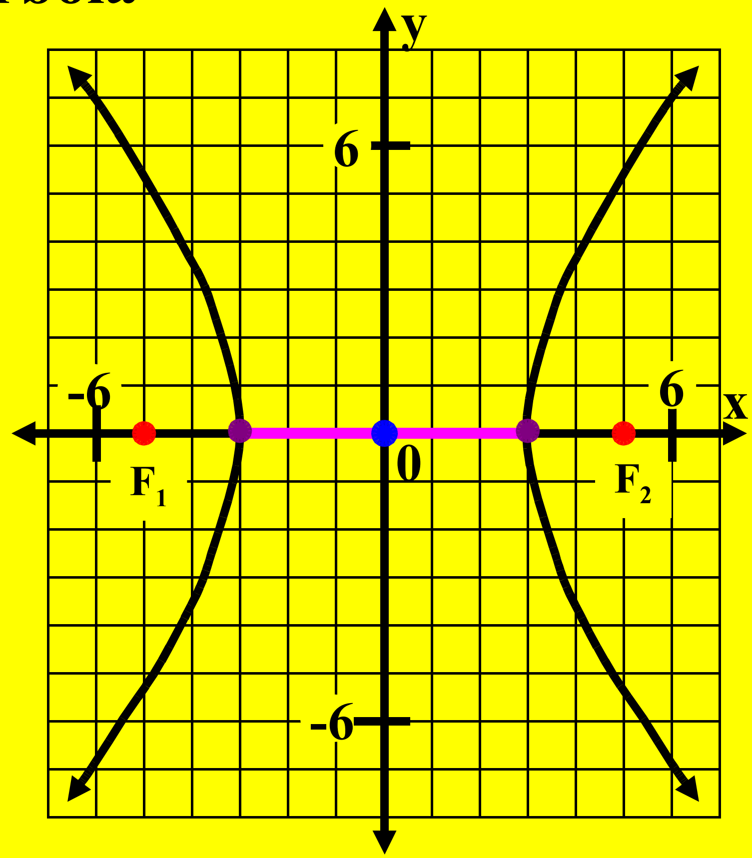
Subtract 144 from both sides.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$$16x^2 - 9y^2 = 144$$

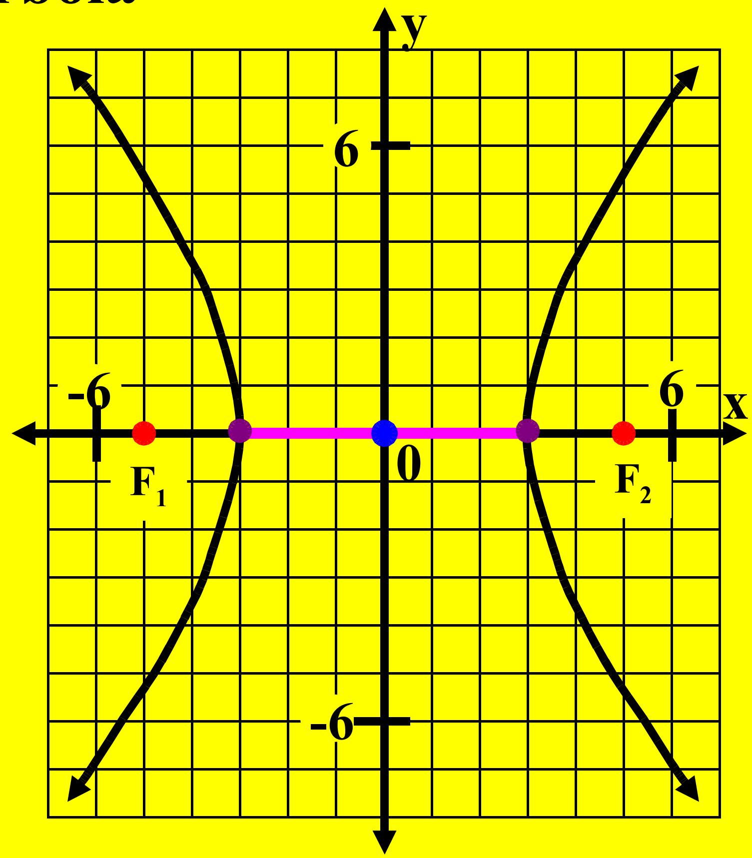
$$16x^2 - 9y^2 - 144 = 0$$

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation



Consider these equations which are equivalent to the standard form equation.

$$16x^2 - 9y^2 = 144$$

$$16x^2 - 9y^2 - 144 = 0$$

This is the <u>general form equation</u> of this hyperbola.

Equations of a Hyperbola

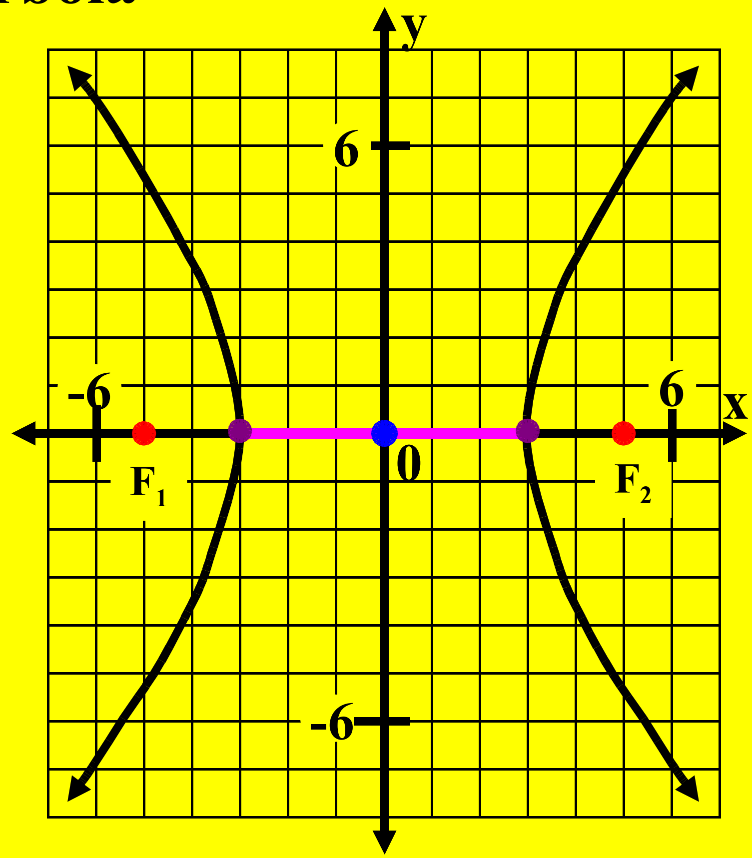
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Equations of a Hyperbola

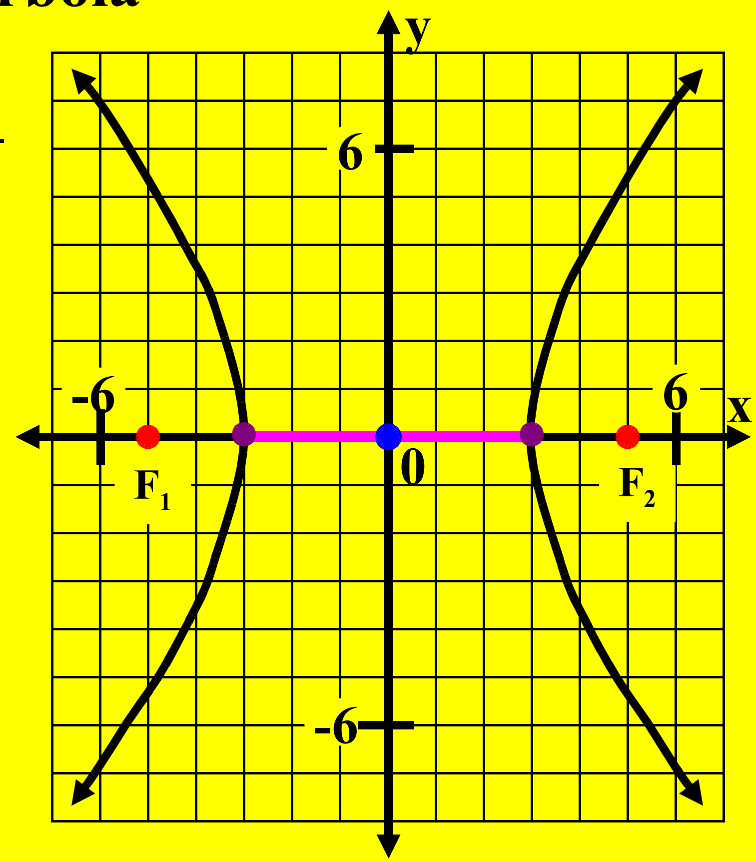
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



We still have more to do to connect the standard form equation to the graph.

Equations of a Hyperbola

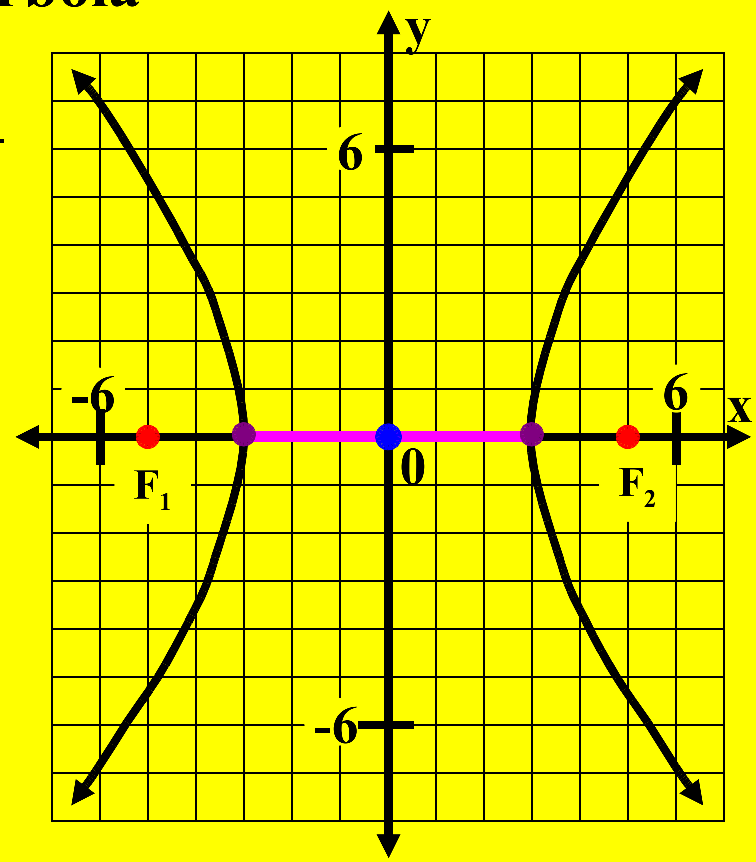
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



We still have more to do to connect the standard form equation to the graph. We will start by solving the general form equation for y.

Equations of a Hyperbola

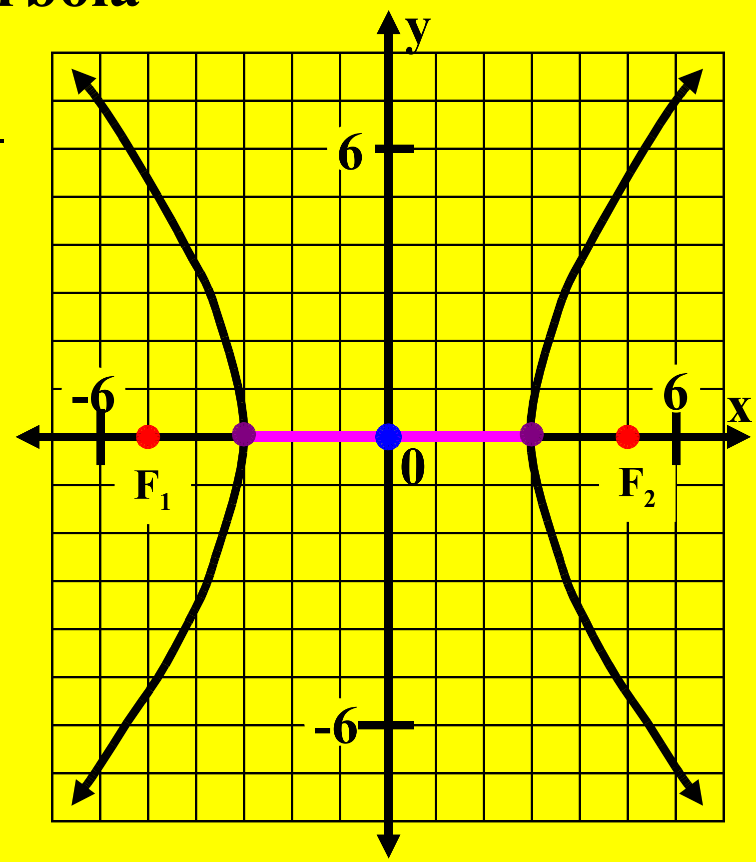
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



We still have more to do to connect the standard form equation to the graph. We will start by solving the general form equation for y.

$$16x^2 - 9y^2 - 144 = 0$$

Equations of a Hyperbola

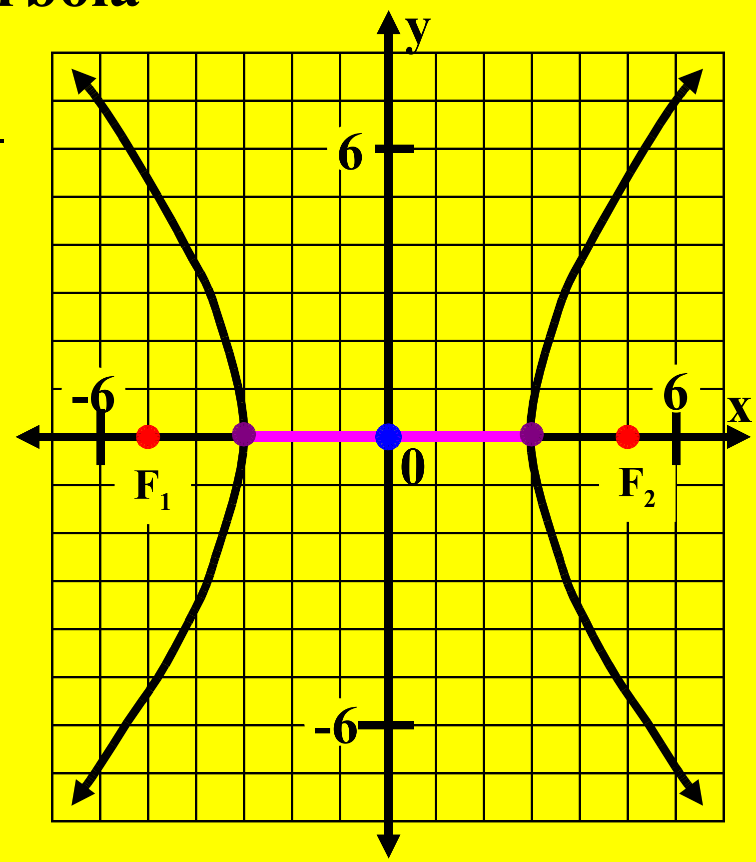
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

Equations of a Hyperbola

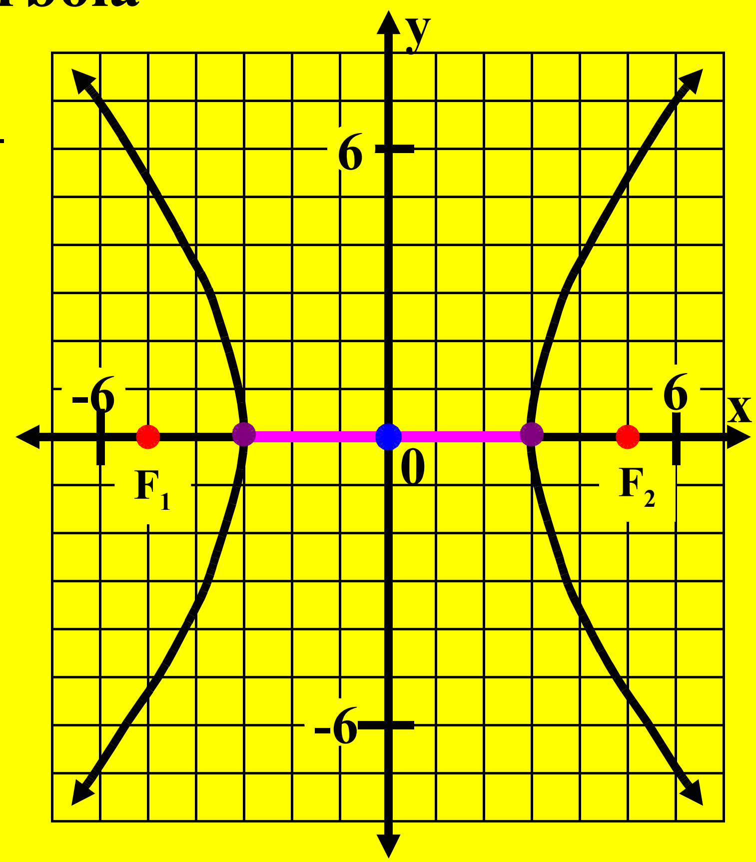
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

Add $9y^2$ to both sides.

Equations of a Hyperbola

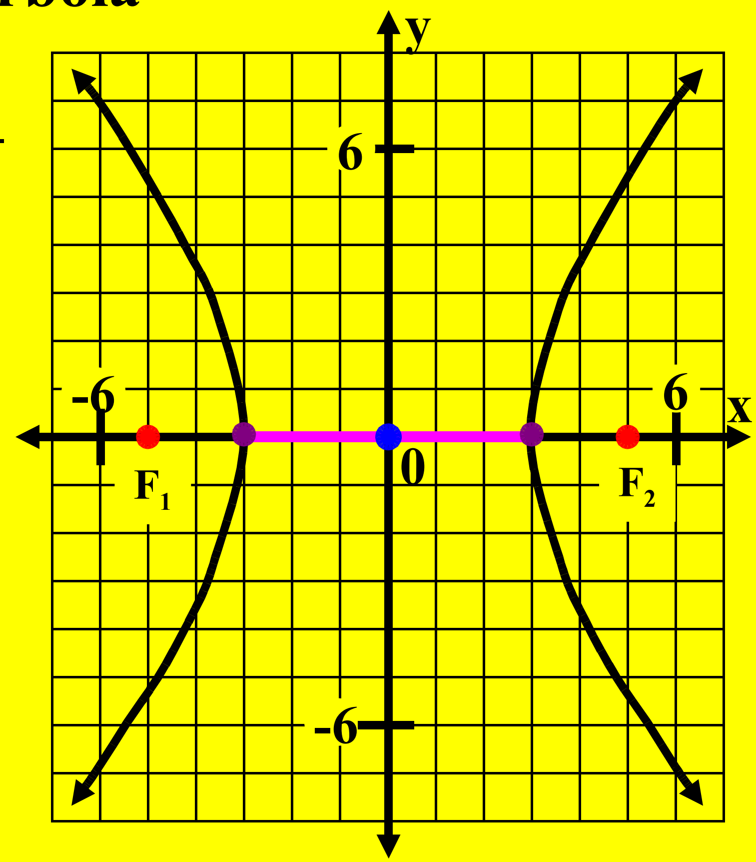
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

$16x^2$

Add $9y^2$ to both sides.

Equations of a Hyperbola

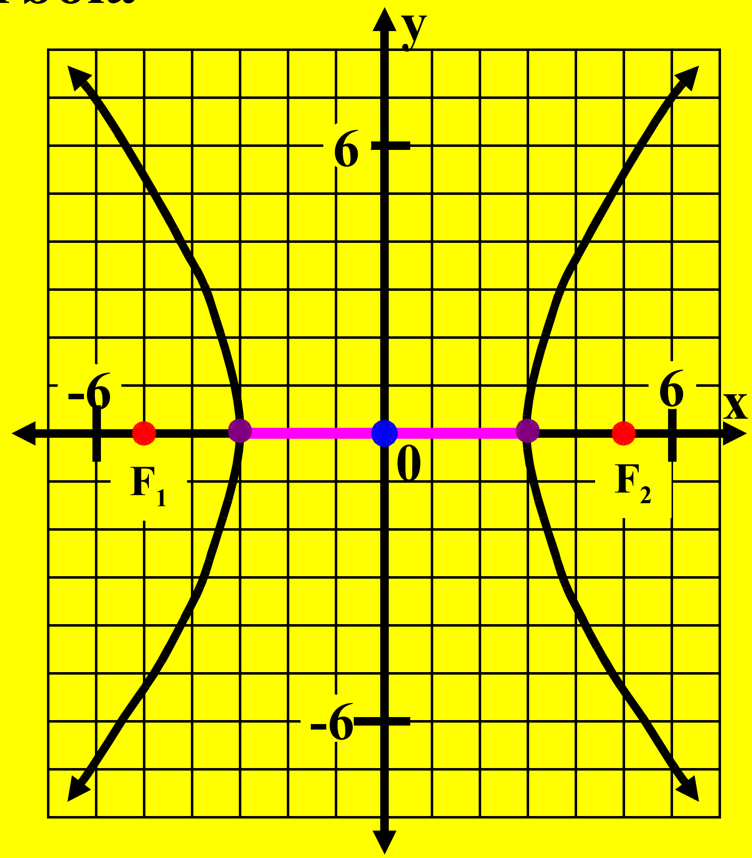
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

$16x^2 - 144$

Add $9y^2$ to both sides.

Equations of a Hyperbola

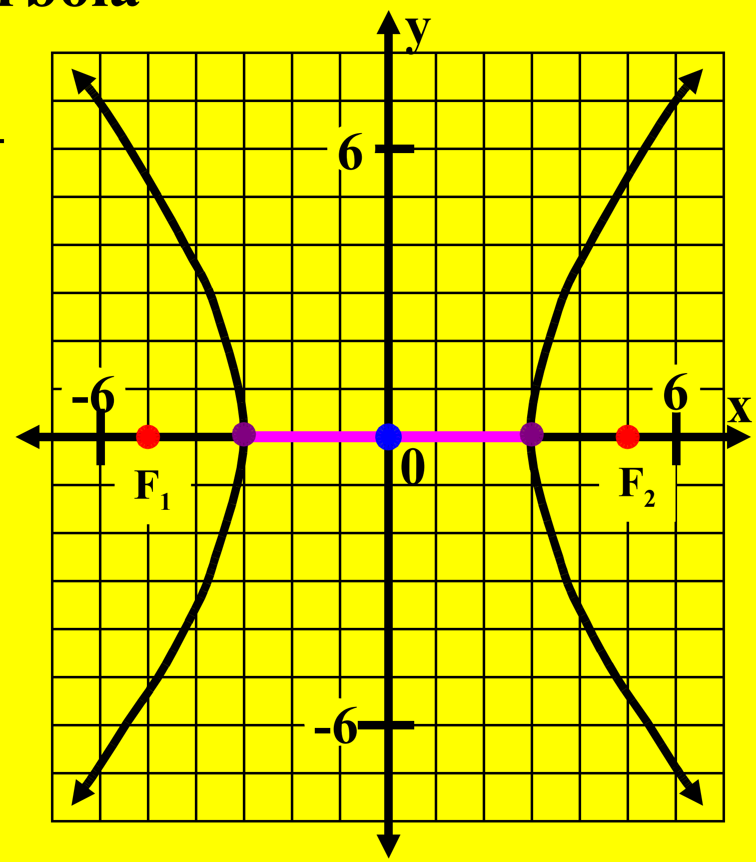
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

$16x^2 - 144 =$

Add $9y^2$ to both sides.

Equations of a Hyperbola

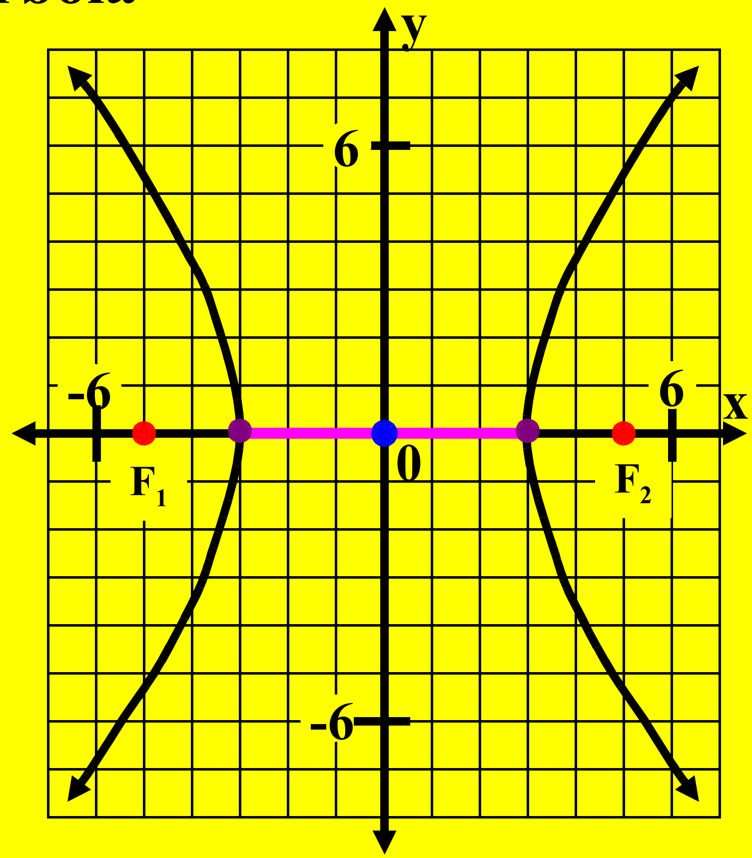
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

$16x^2 - 144 = 9y^2$

Add $9y^2$ to both sides.

Equations of a Hyperbola

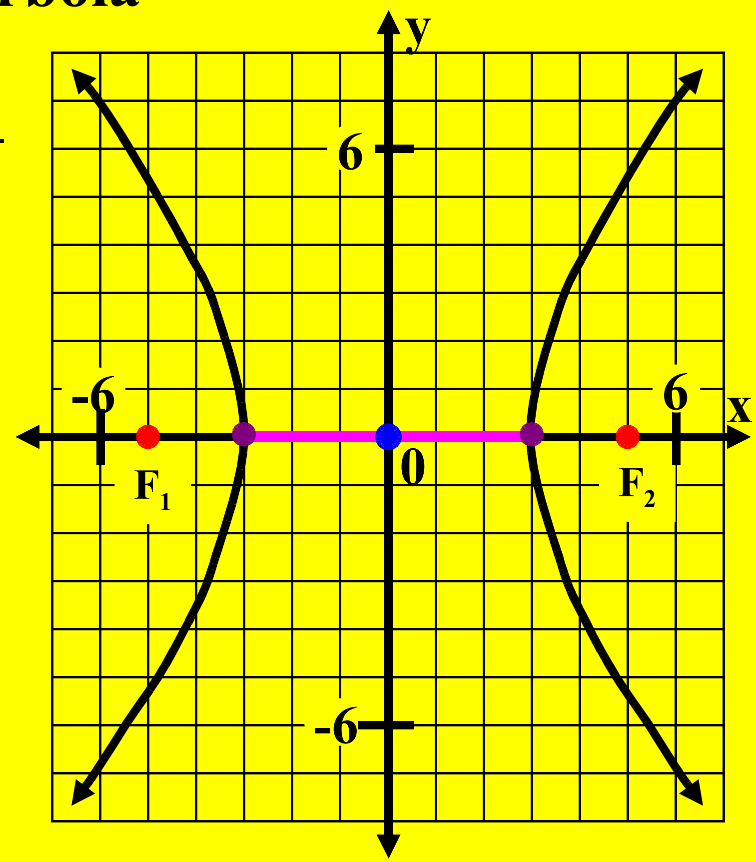
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

$16x^2 - 144 = 9y^2$

Equations of a Hyperbola

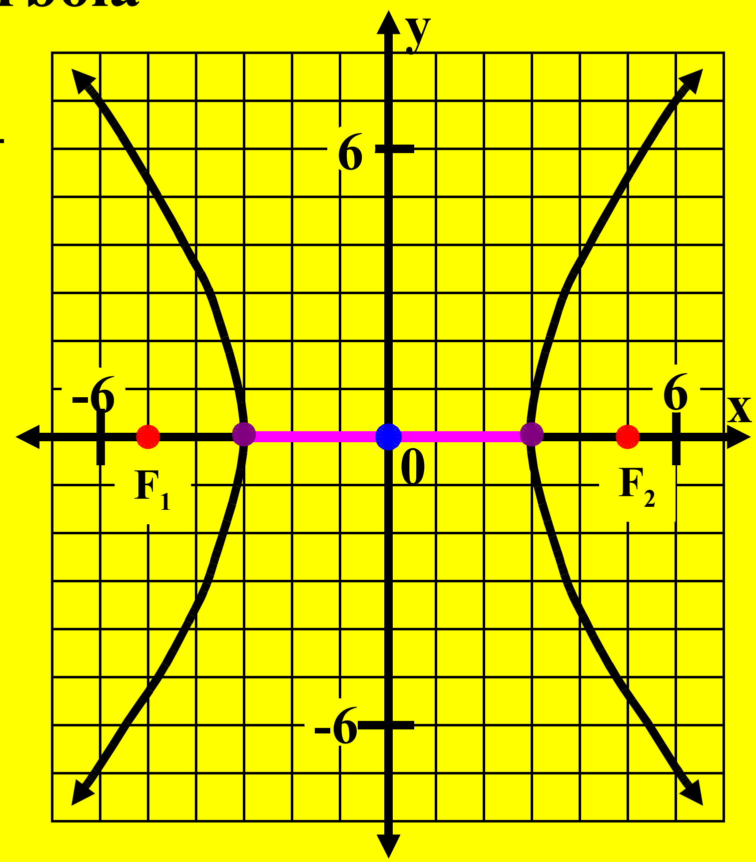
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

$16x^2 - 144 = 9y^2$

Factor the left side of the equation.

Equations of a Hyperbola

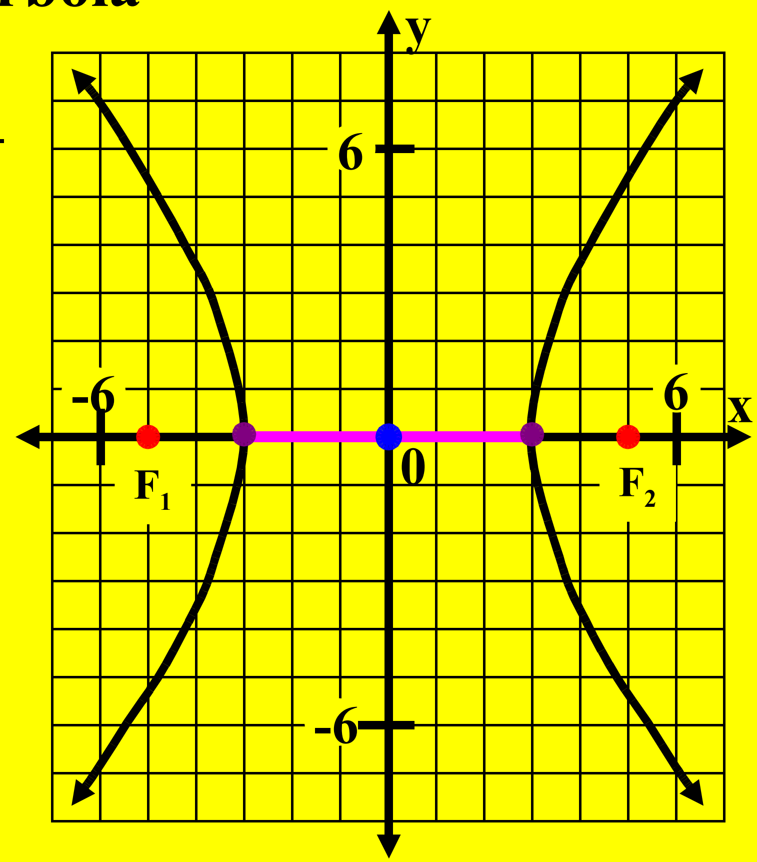
If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$16x^2 - 9y^2 - 144 = 0$$

General Form Equation



Solve for y: $16x^2 - 9y^2 - 144 = 0$

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Factor the left side of the equation. Factor out $16x^2$!

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

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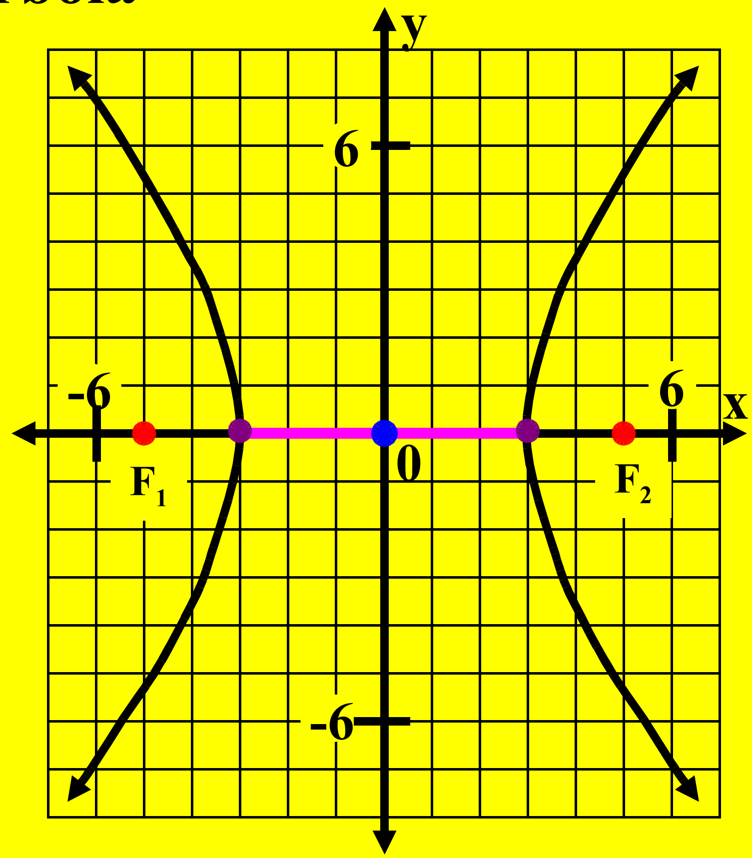

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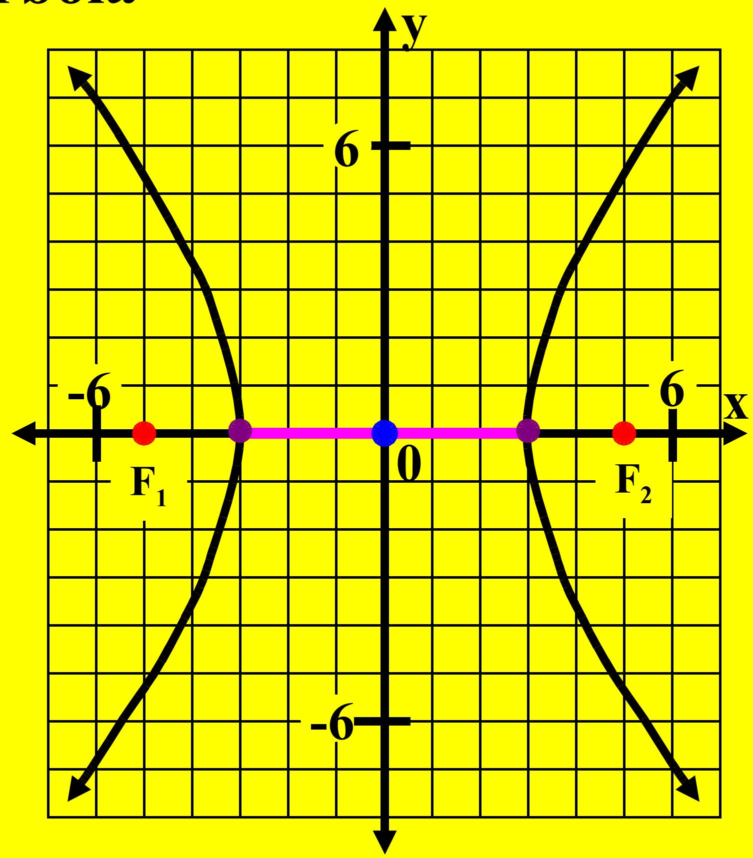

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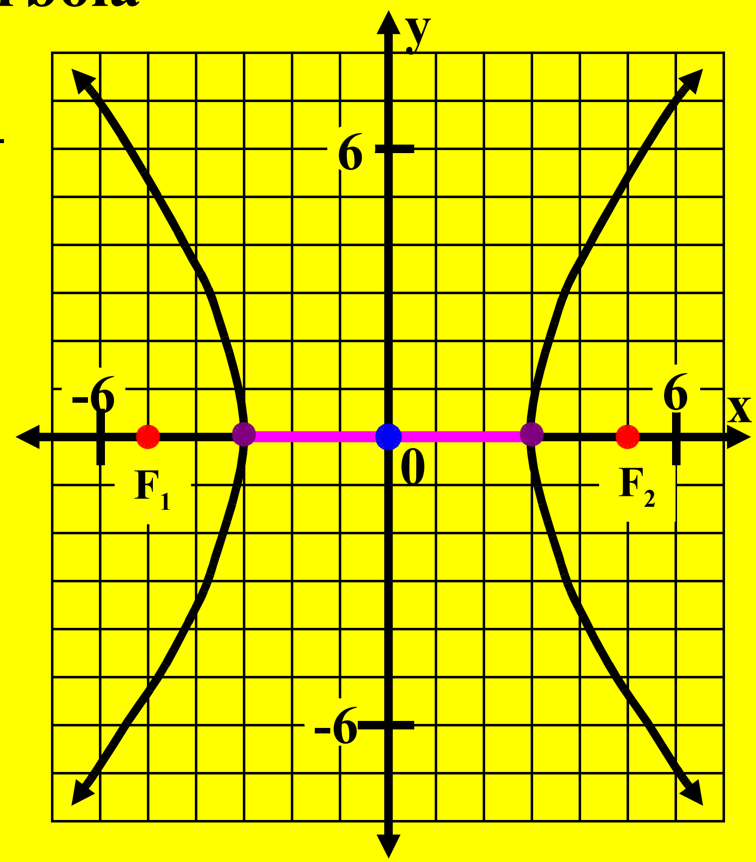

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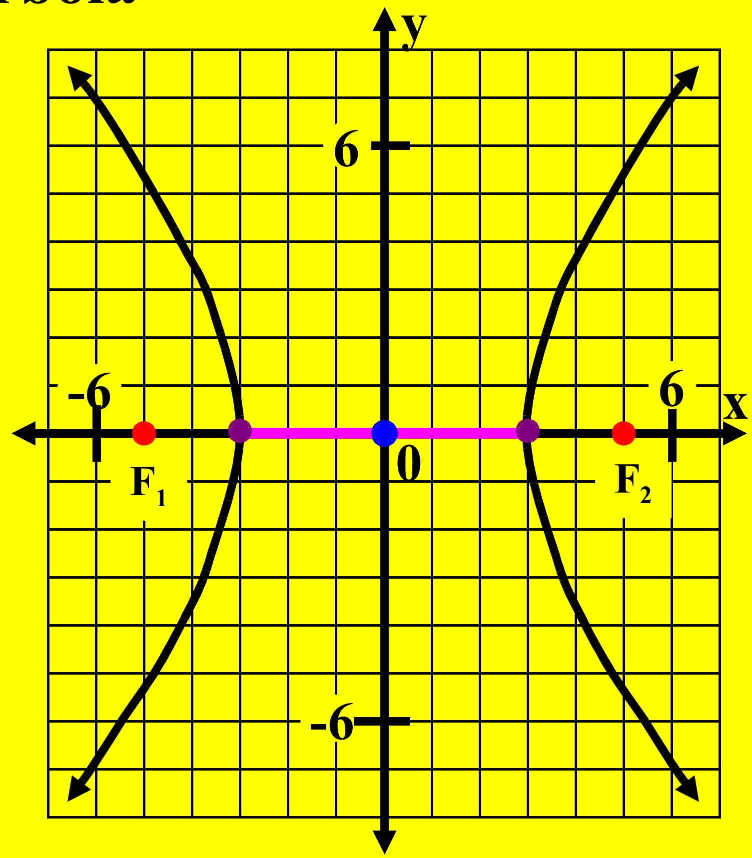

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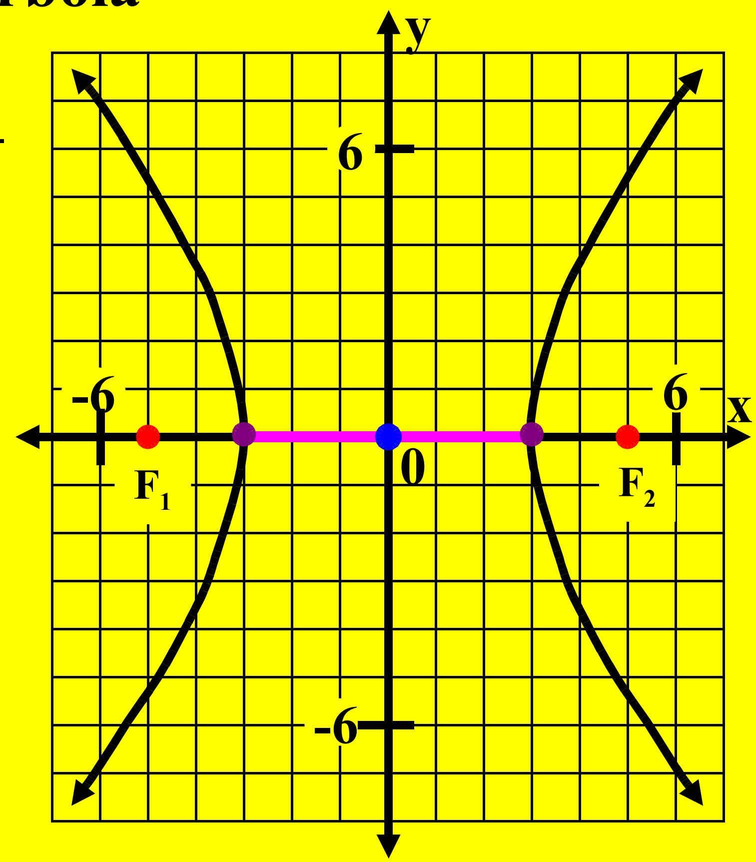

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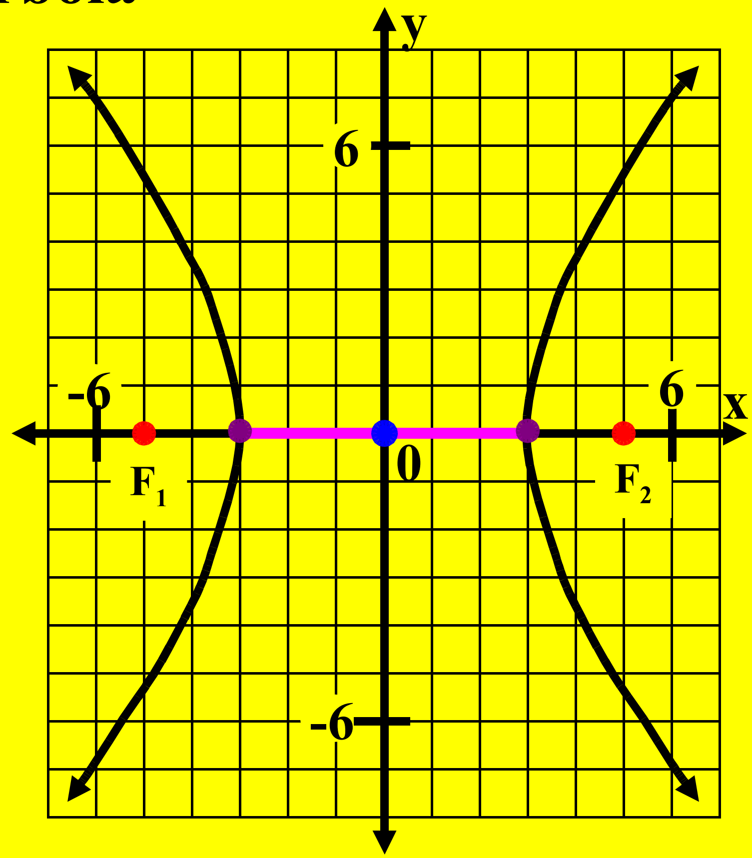

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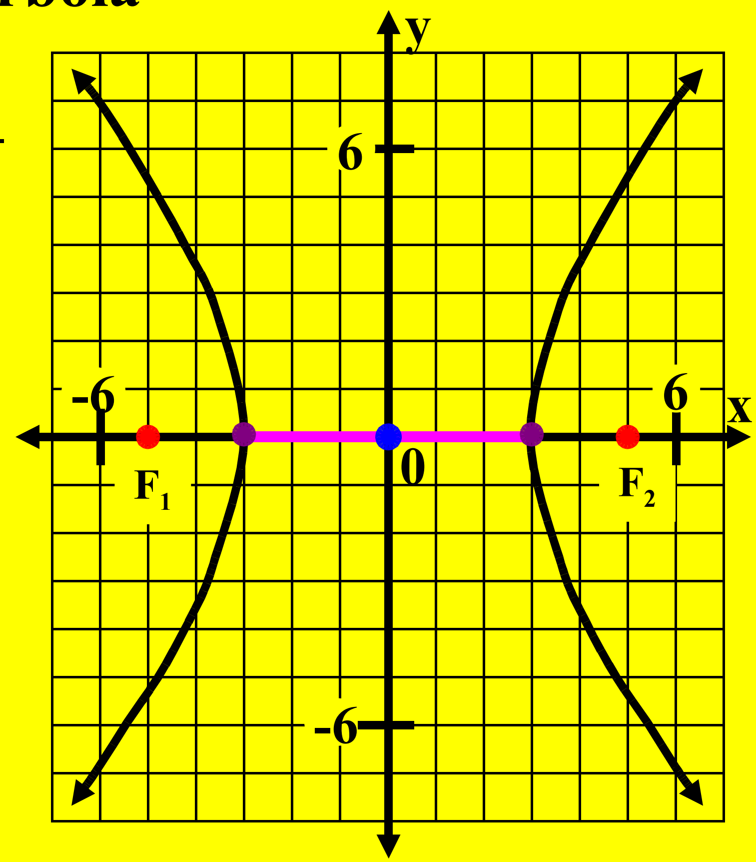

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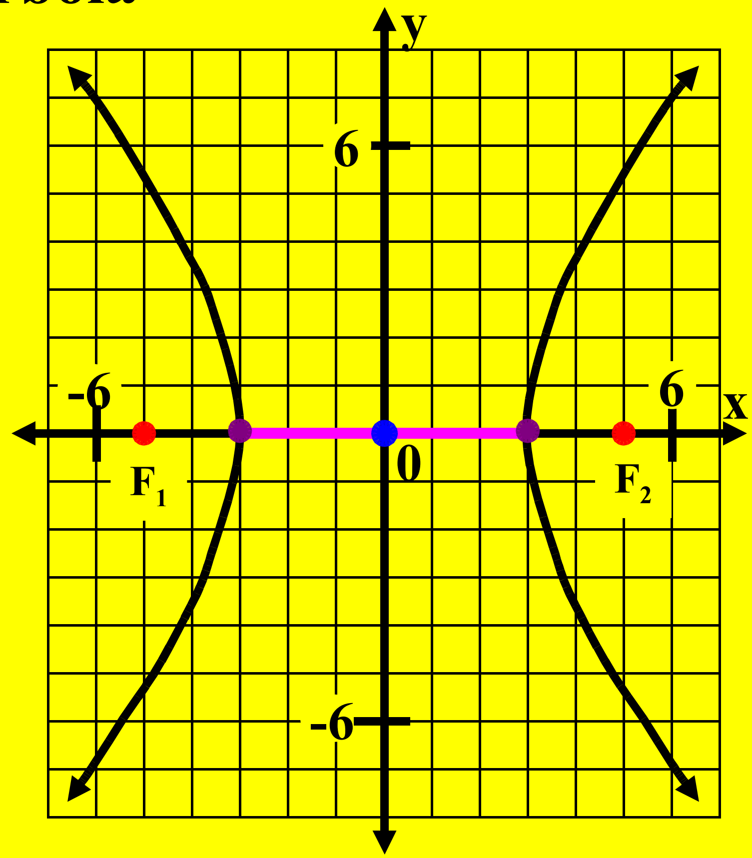

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Multiply both sides of the equation by 1/9.

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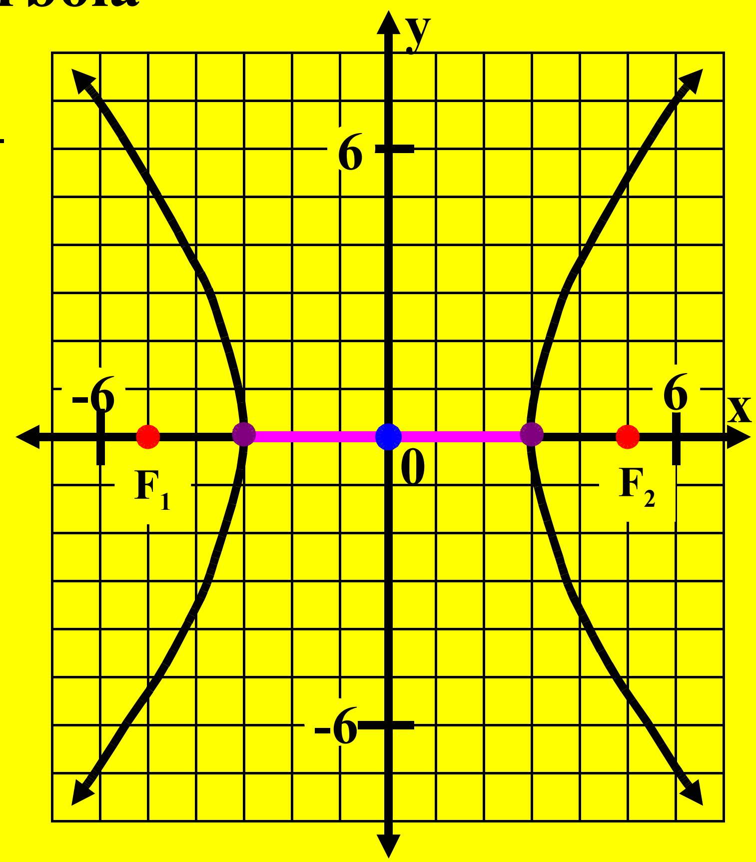

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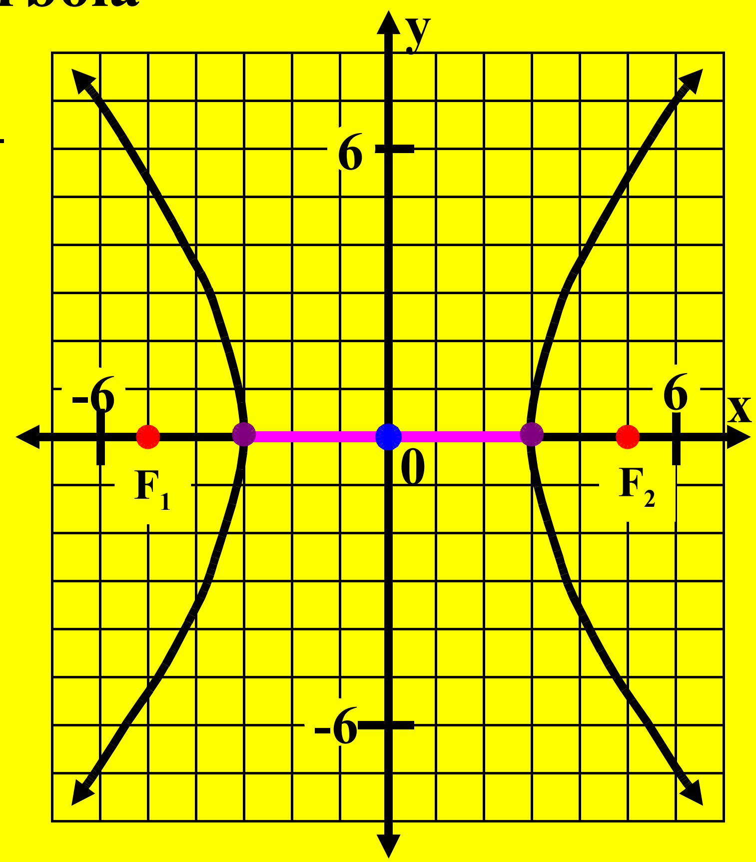

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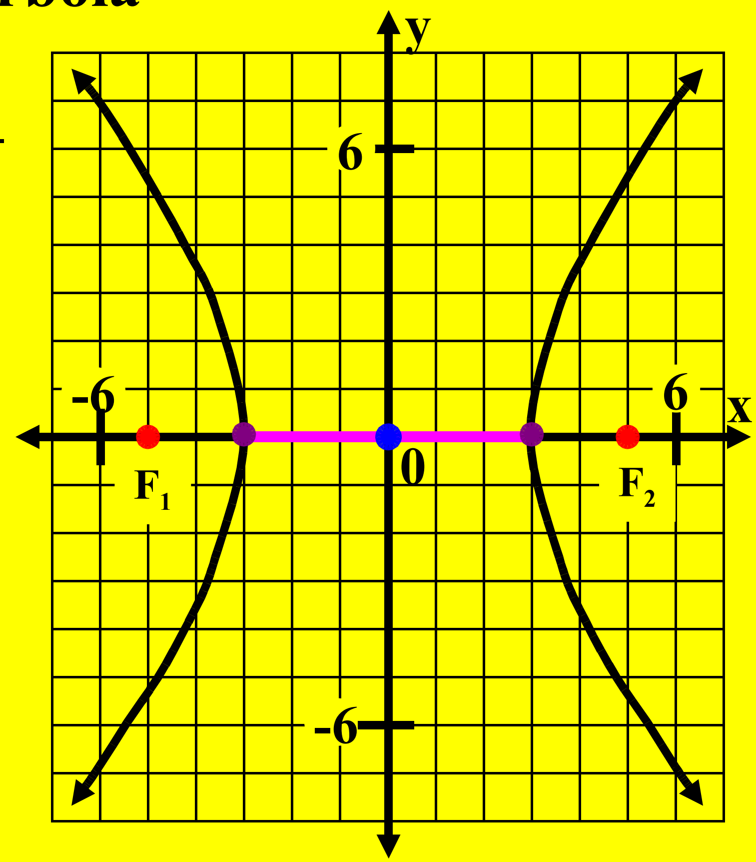

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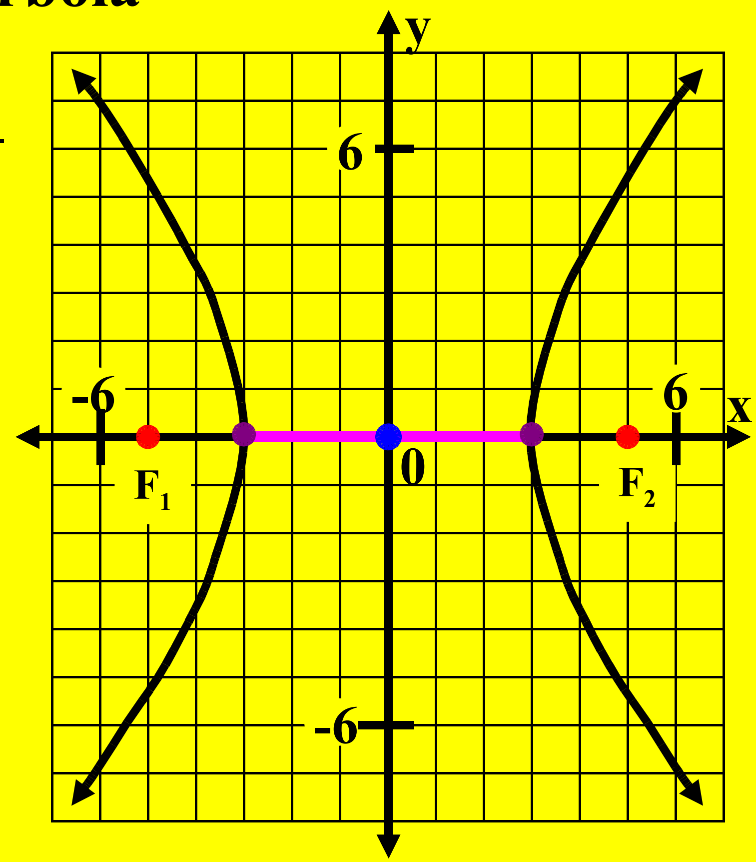

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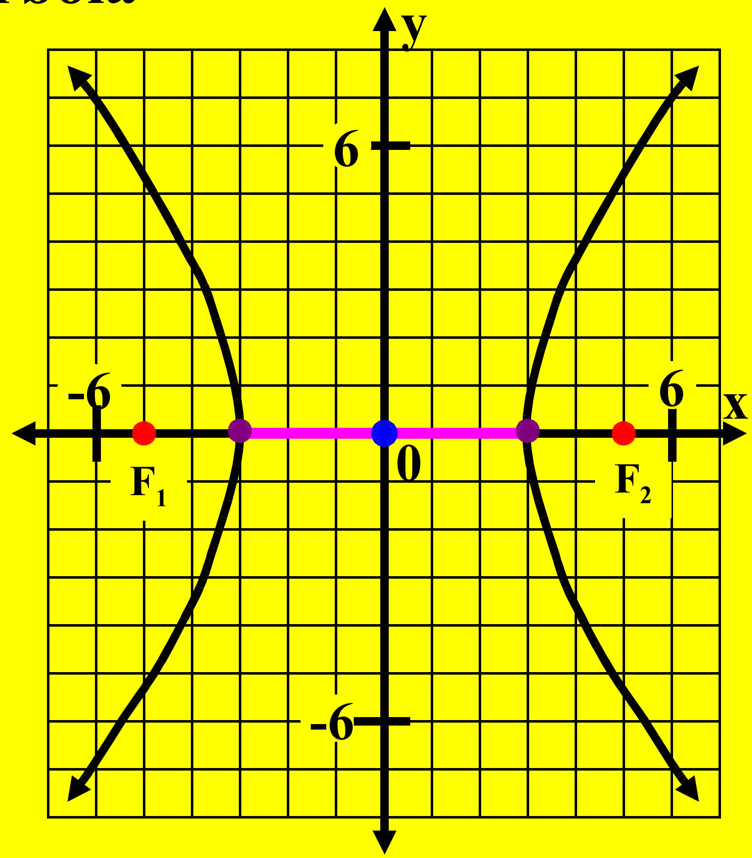

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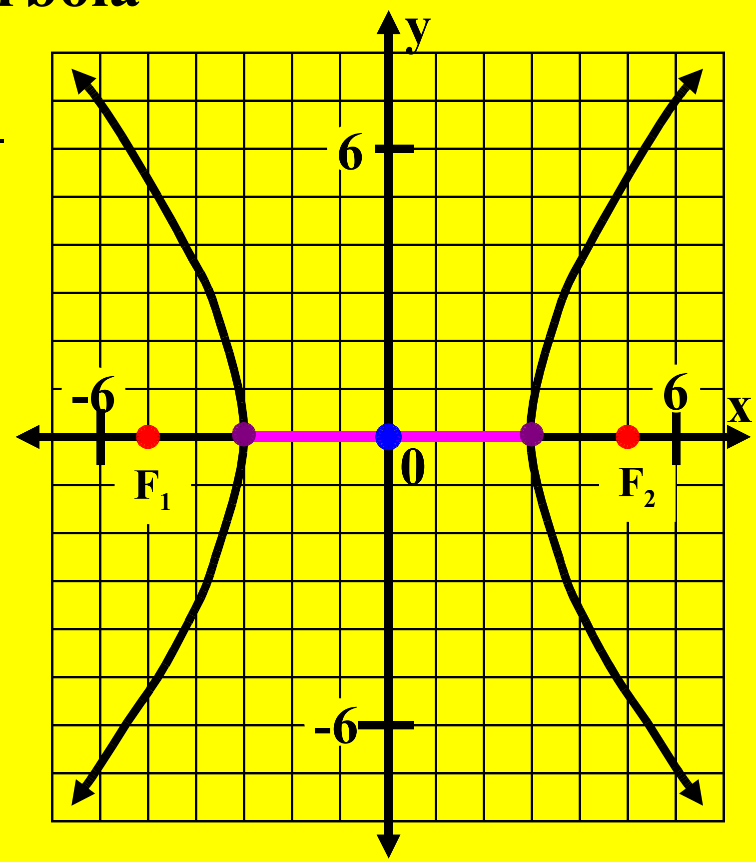

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Apply the square root property to solve for y.

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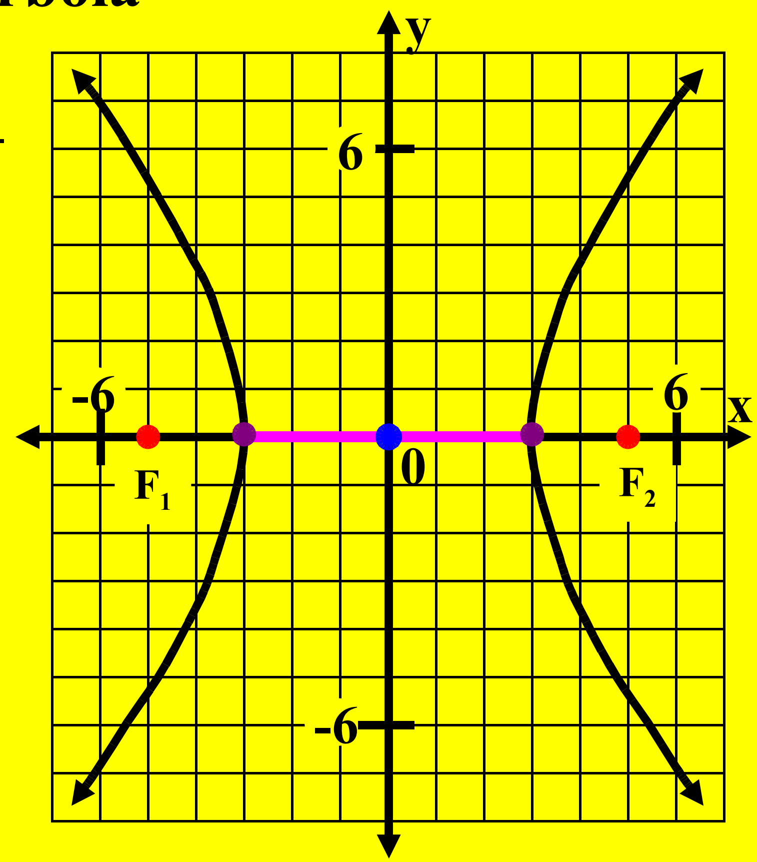

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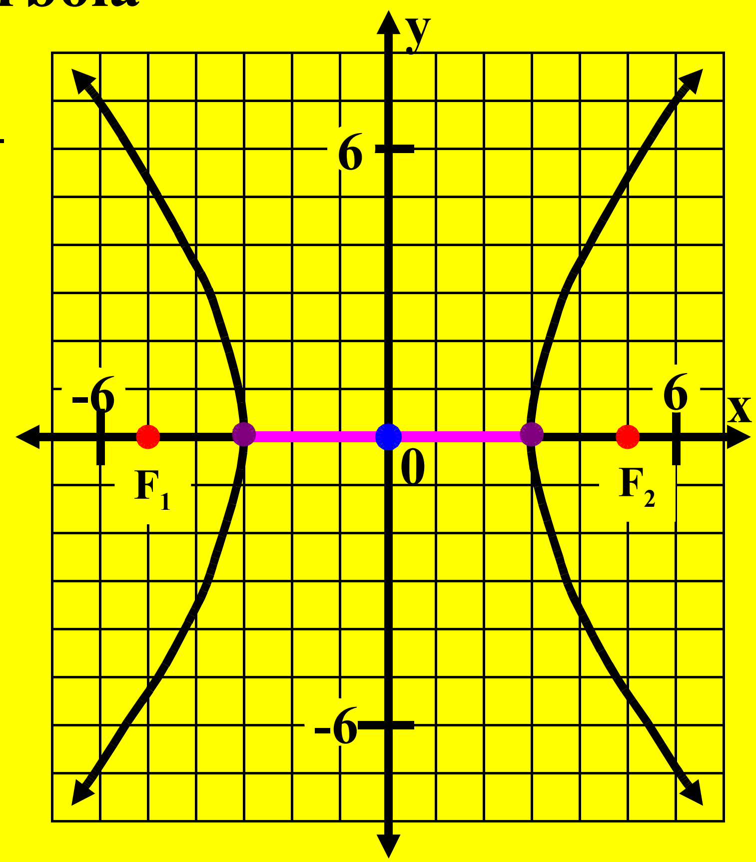

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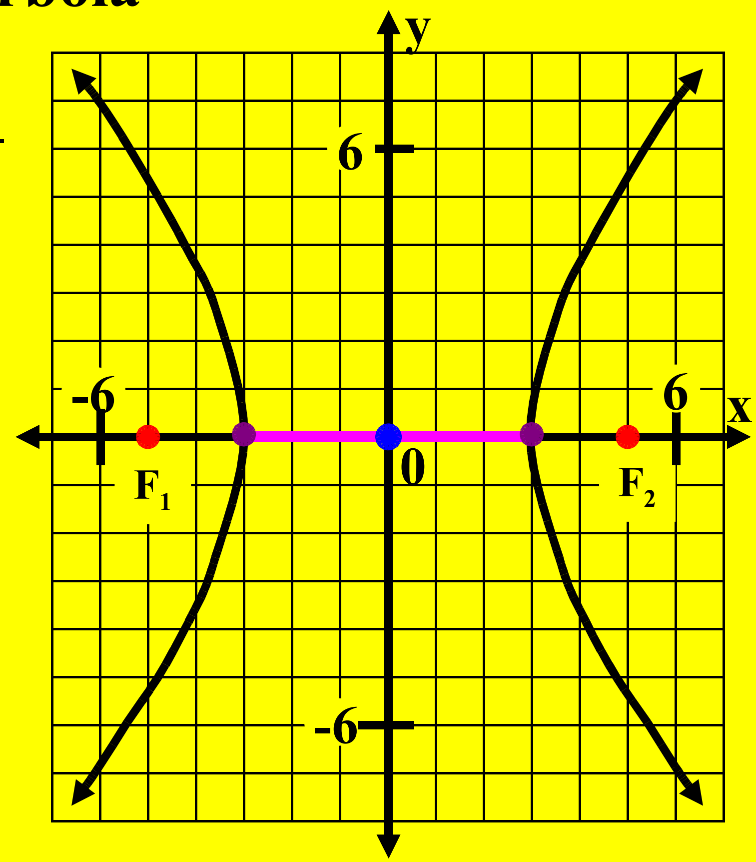

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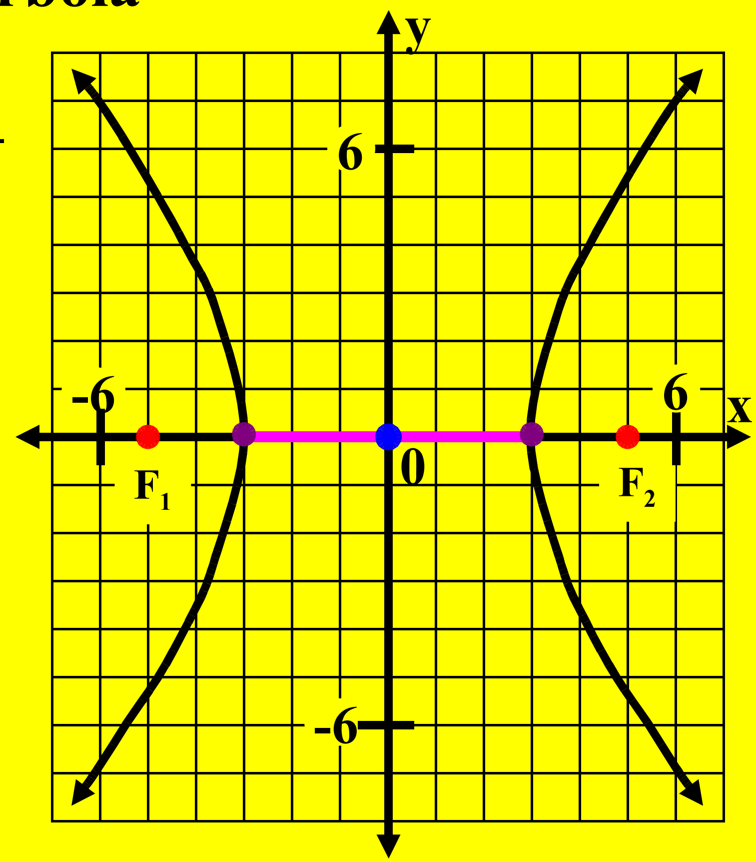

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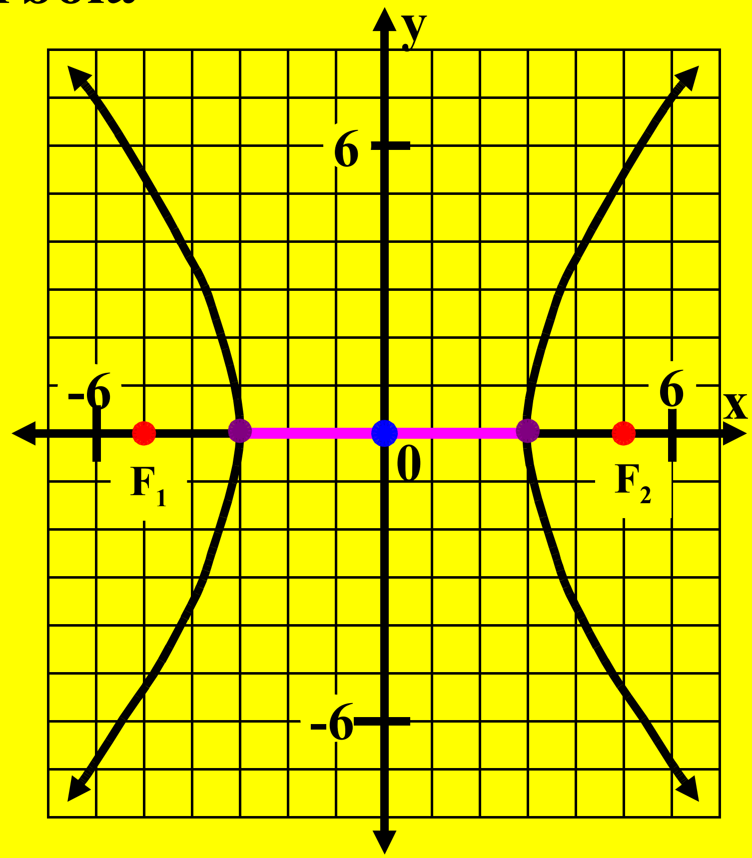

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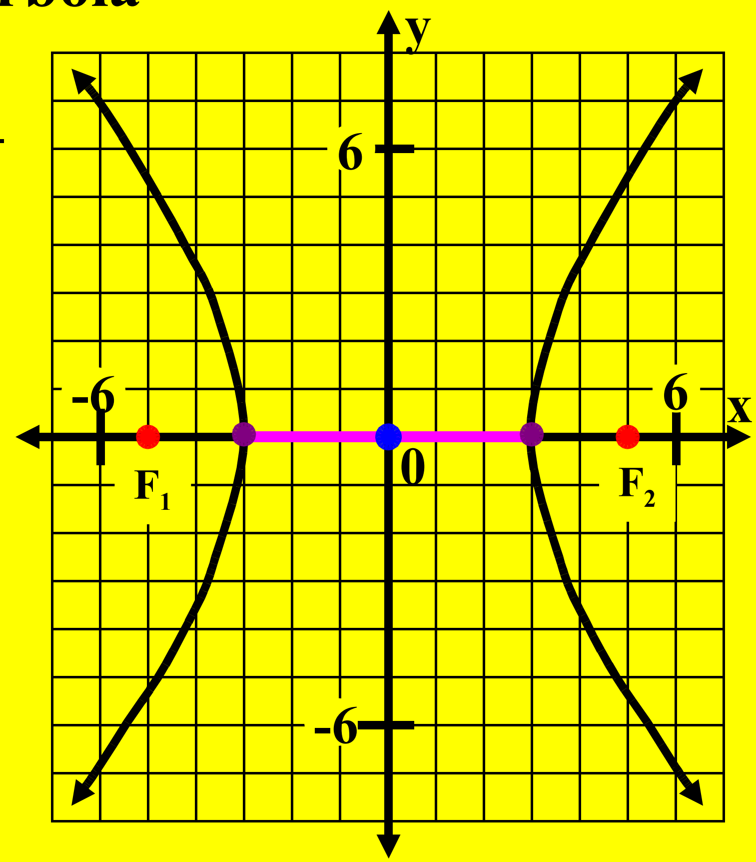

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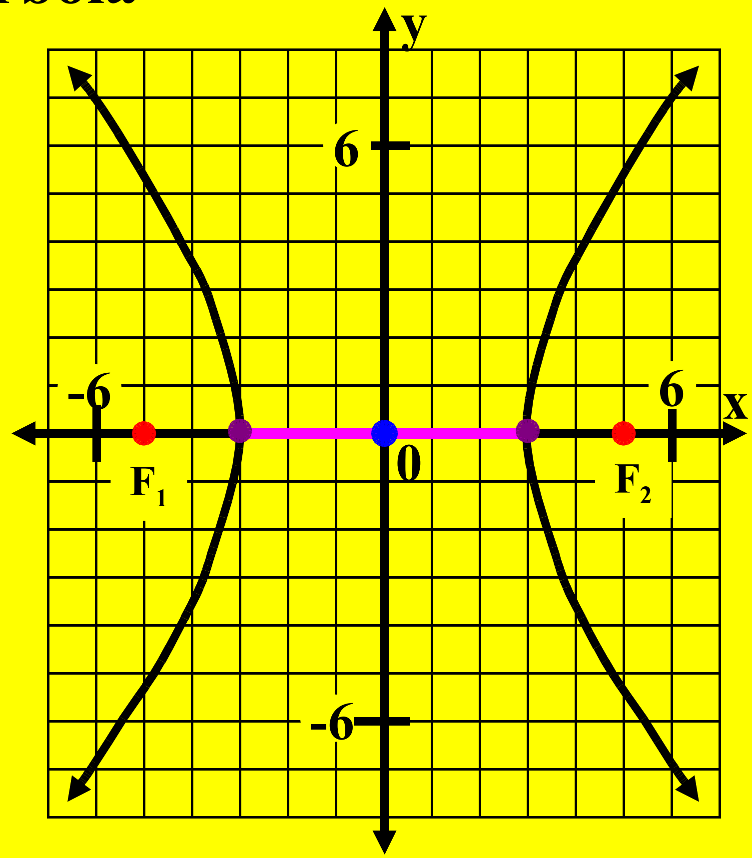

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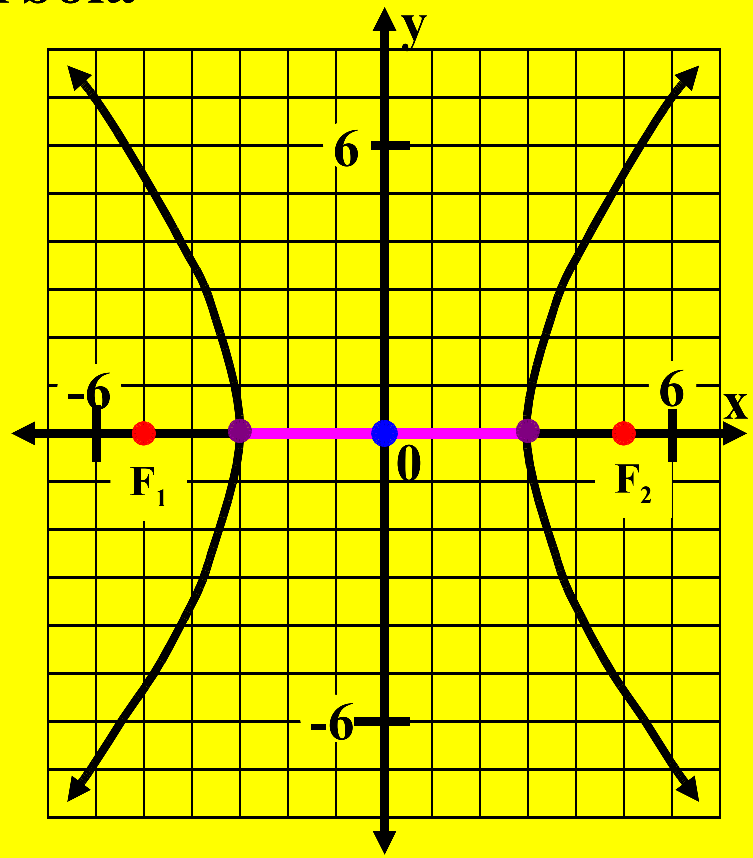

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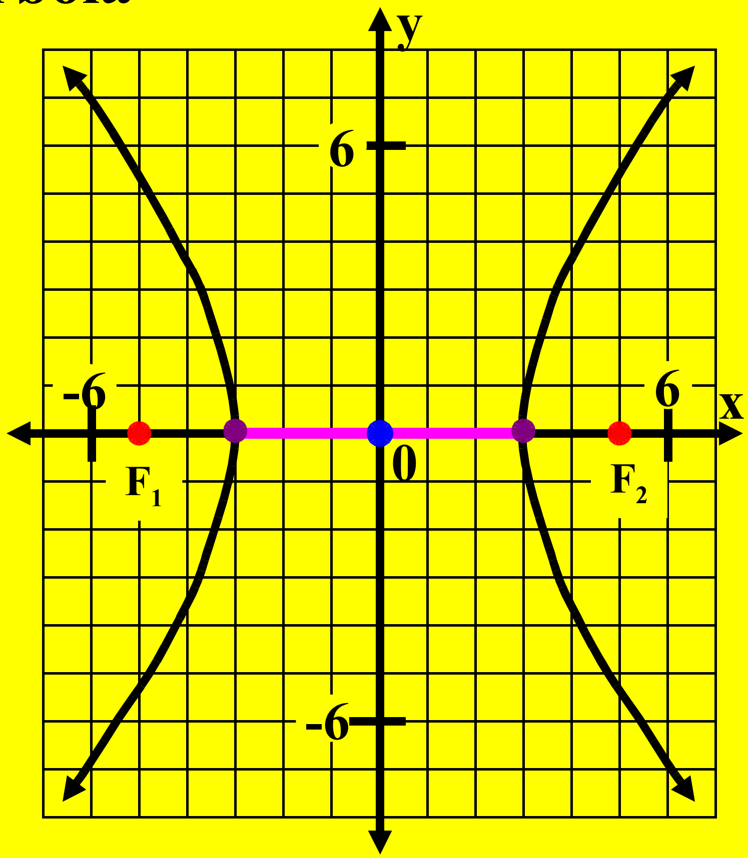

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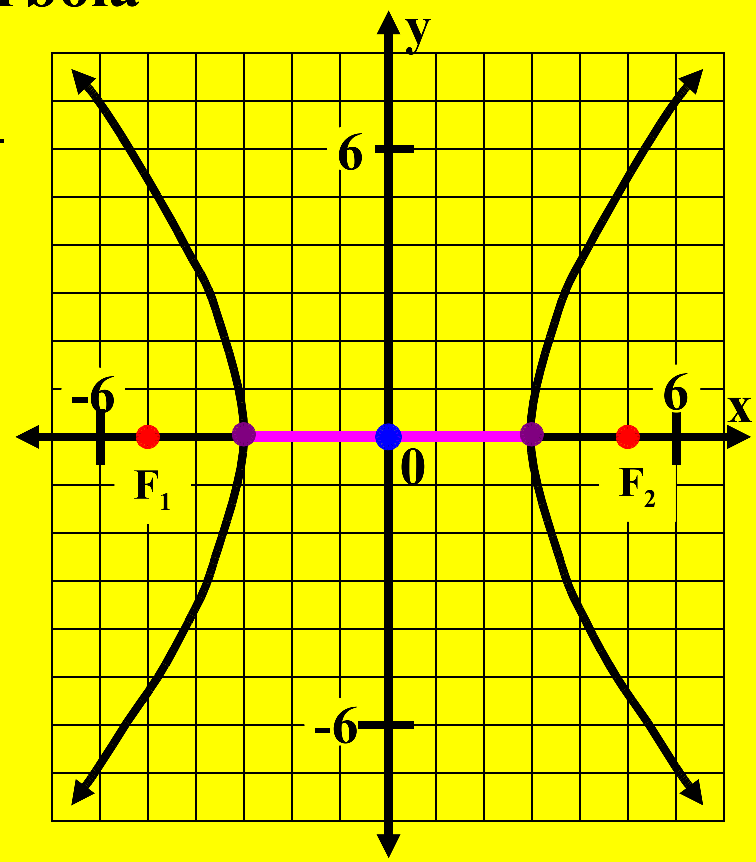

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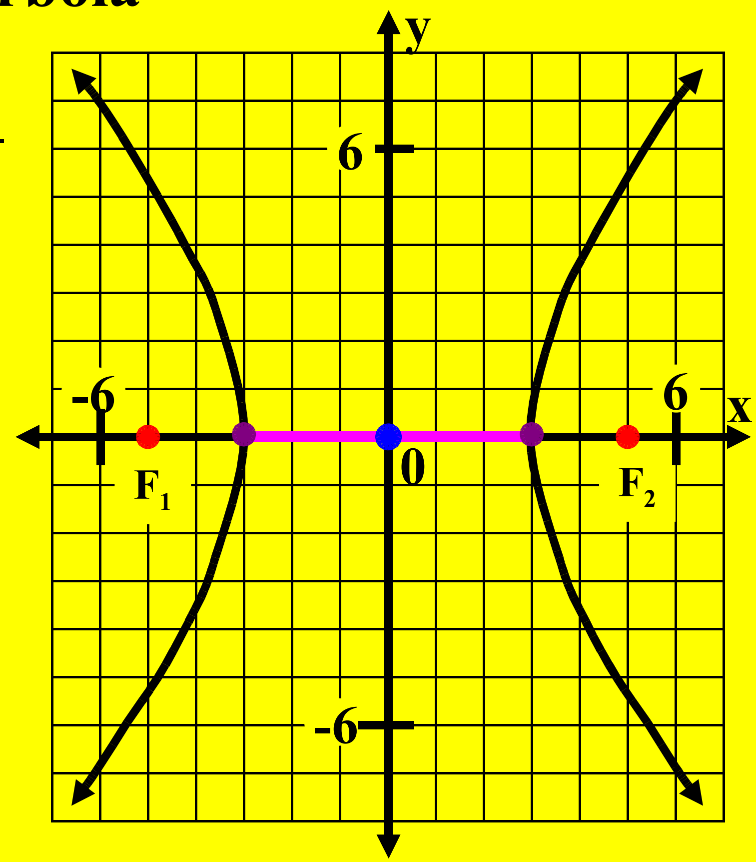

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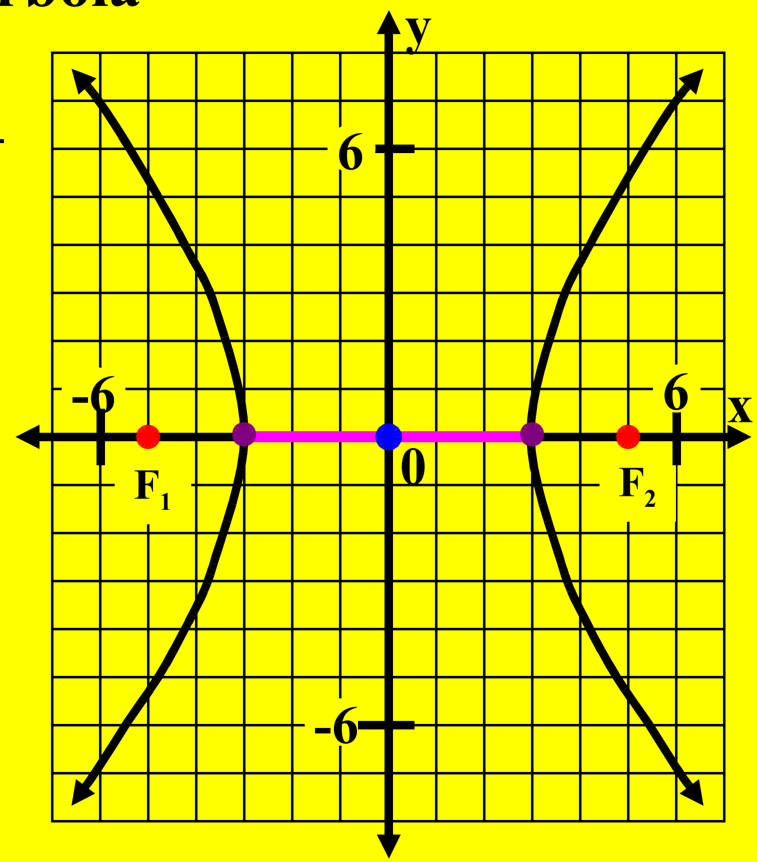

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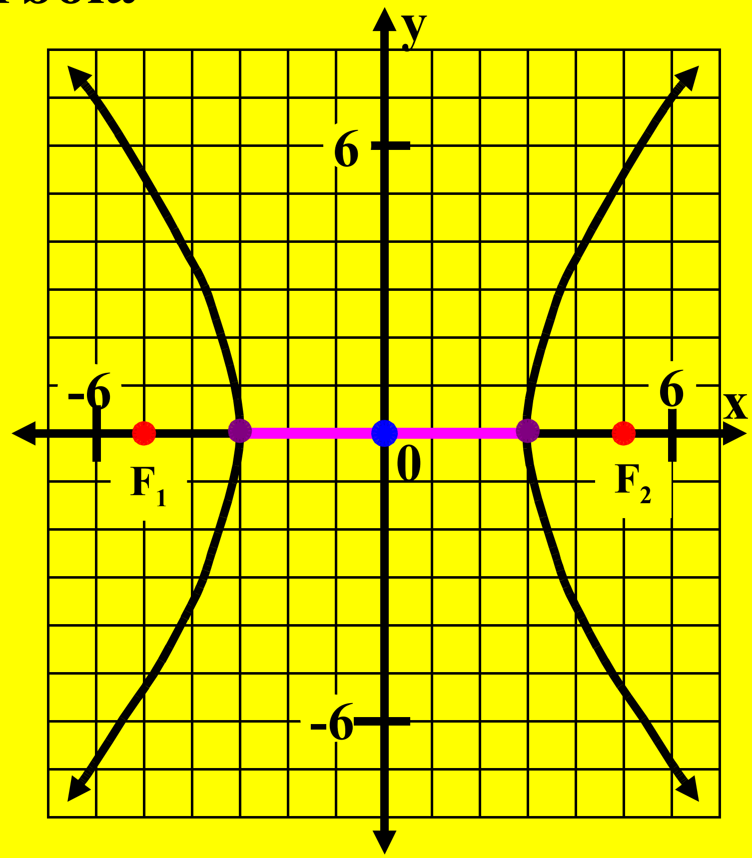

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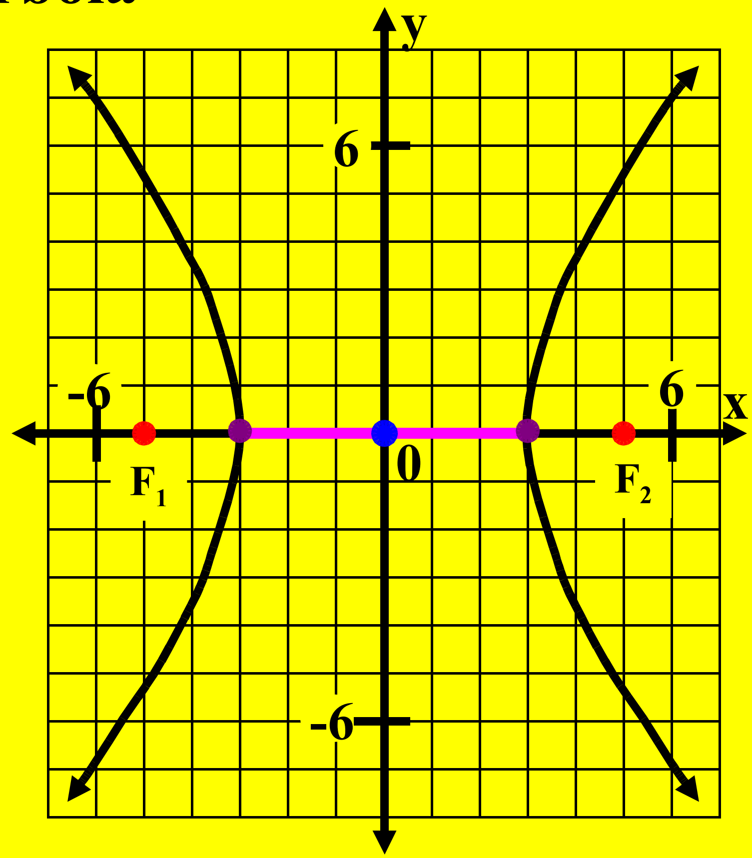
First consider the 'right branch' of this hyperbola.



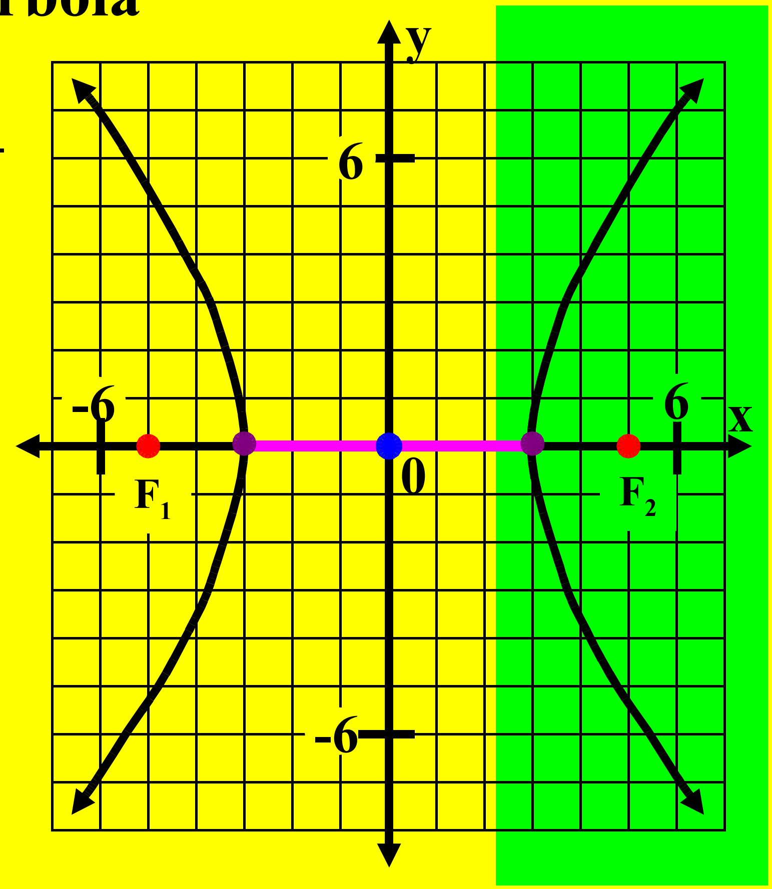
Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{9} - \frac{y^2}{16} = 1$$

Standard Form Equation

$$y = \pm\frac{4x}{3}\sqrt{\left(1 - \frac{9}{x^2}\right)}$$



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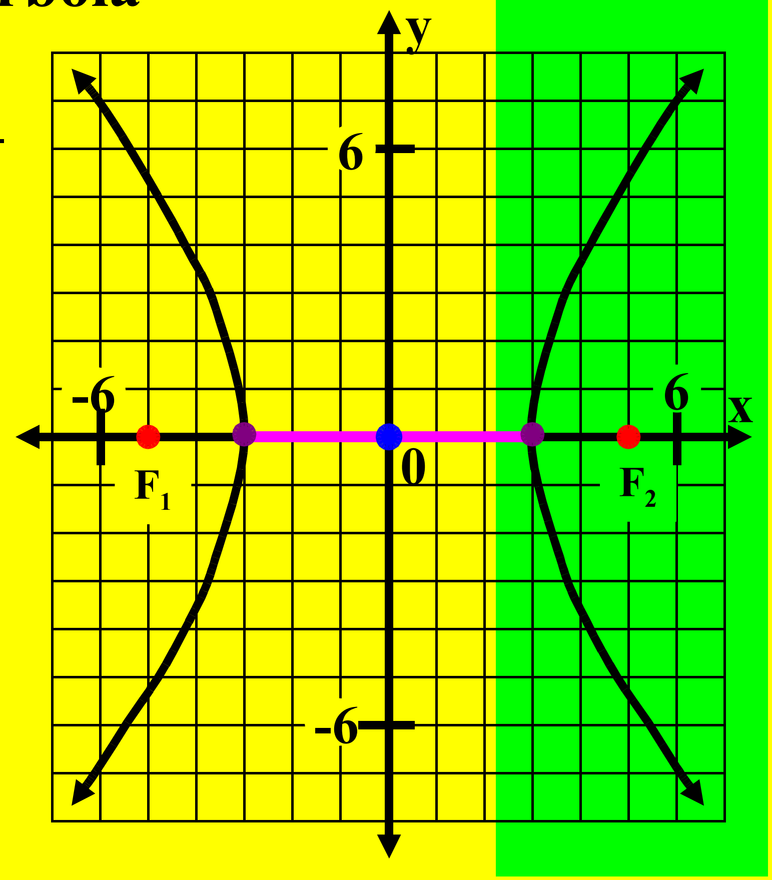

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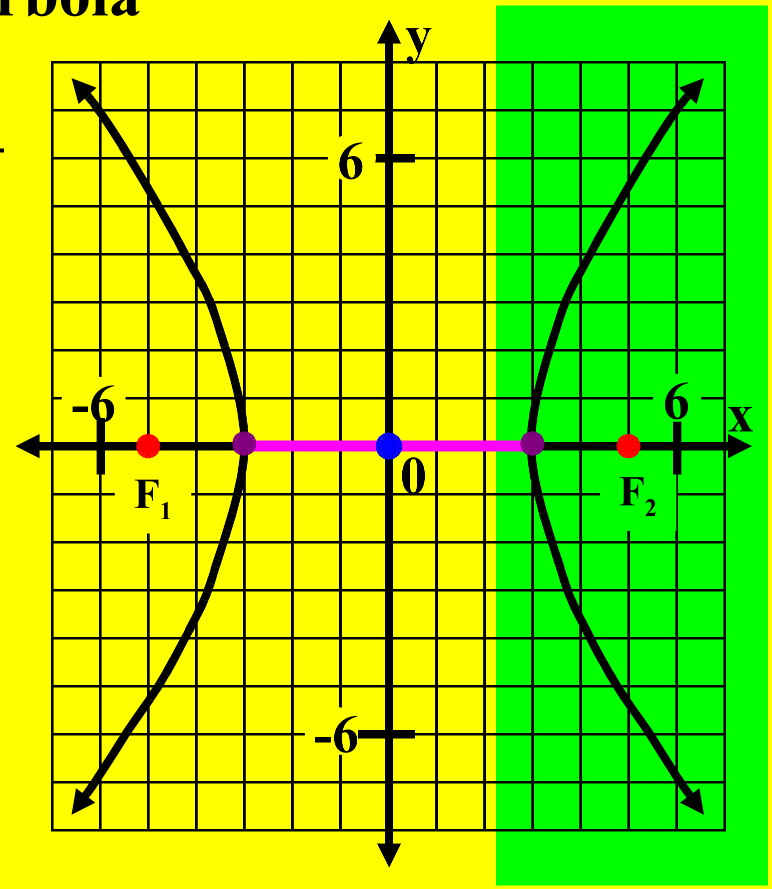

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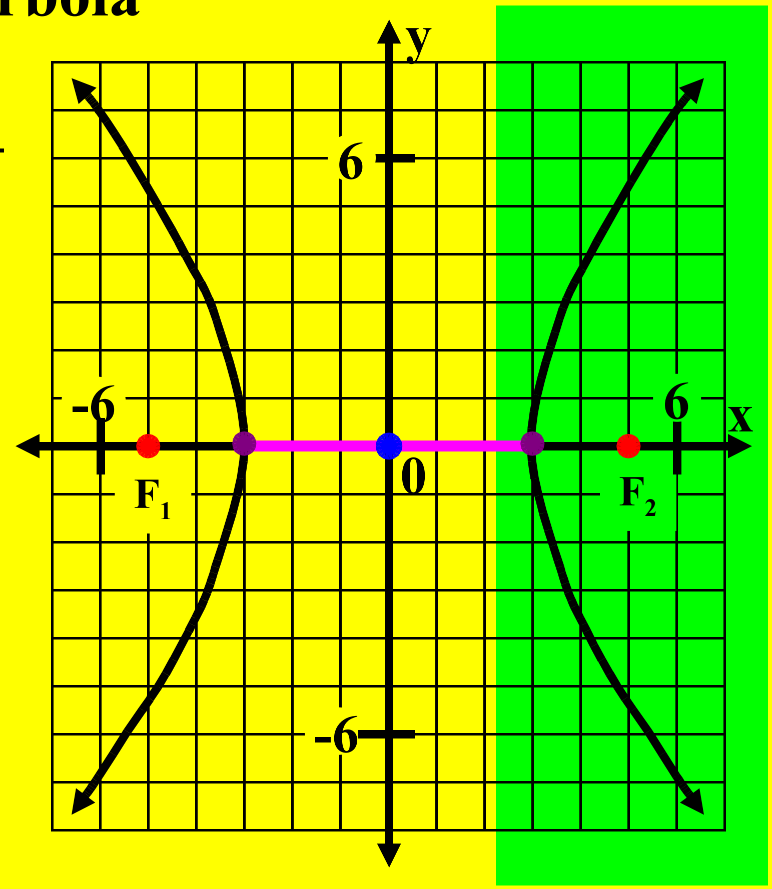

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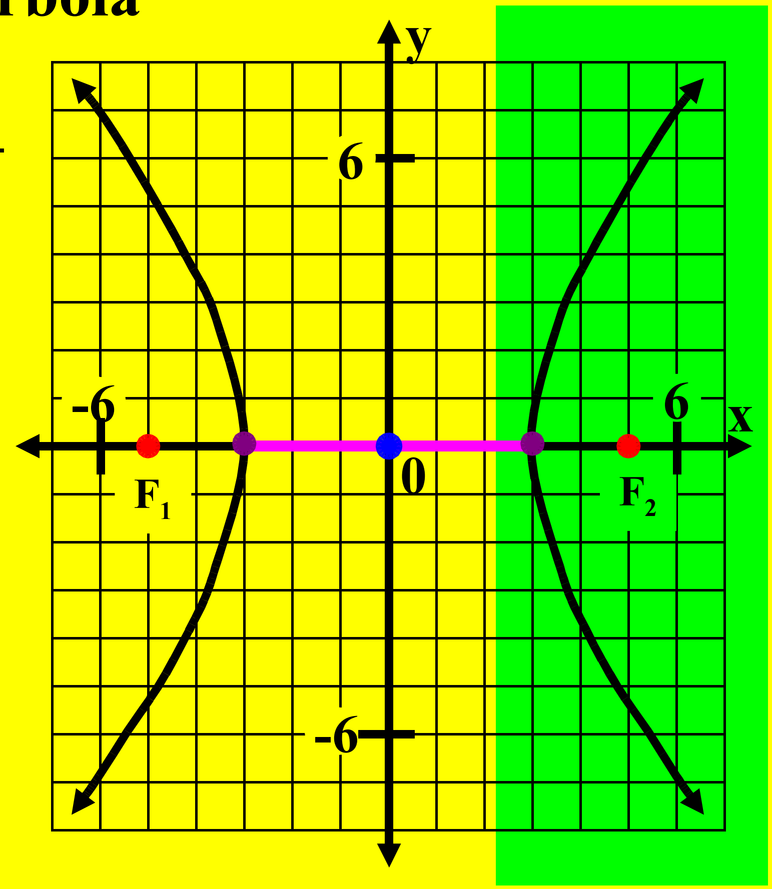

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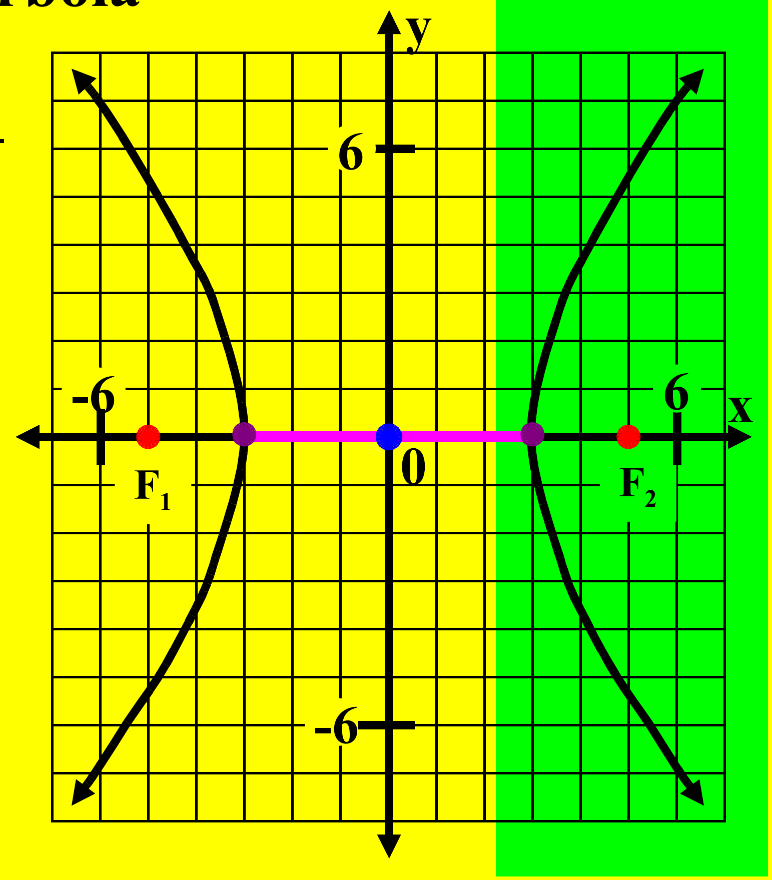

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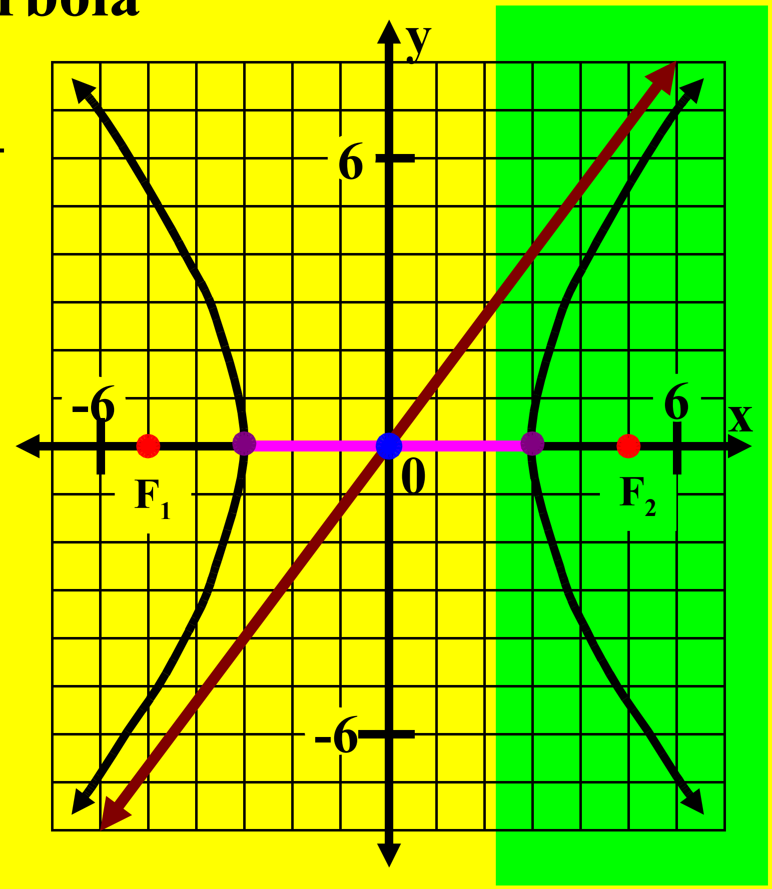

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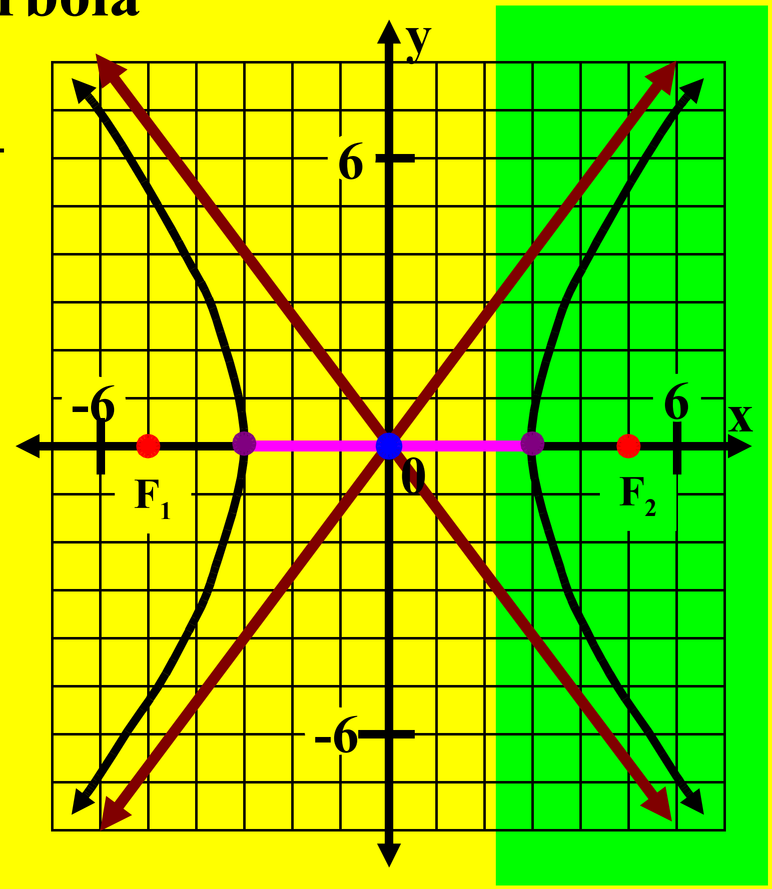

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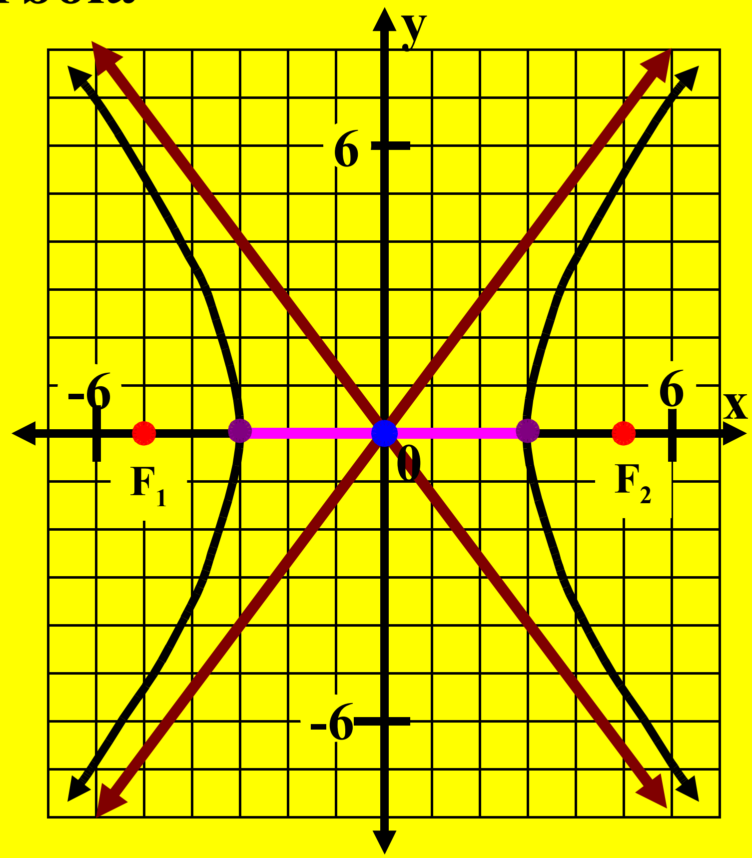

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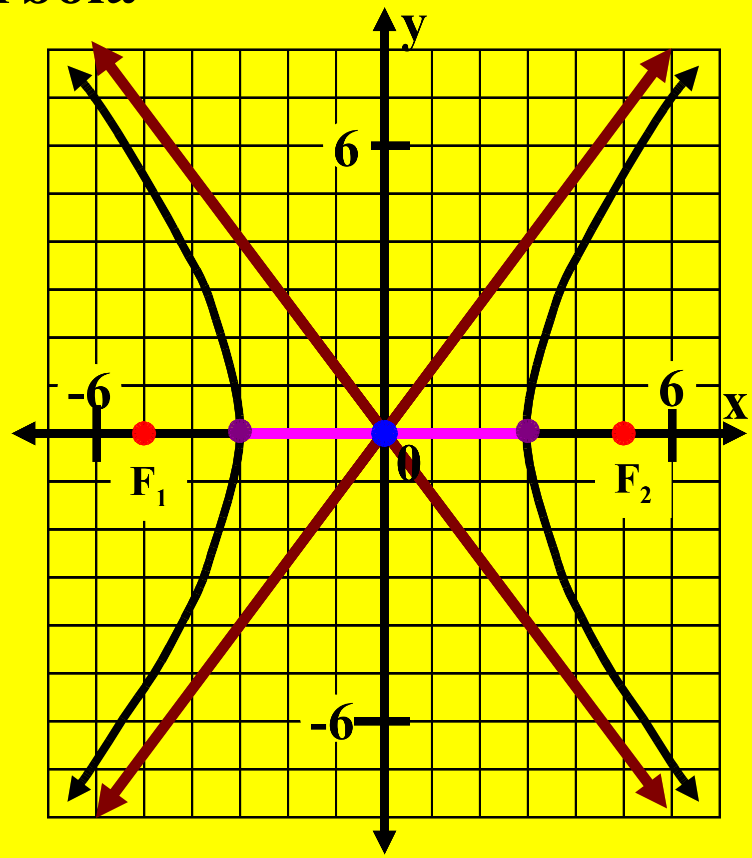

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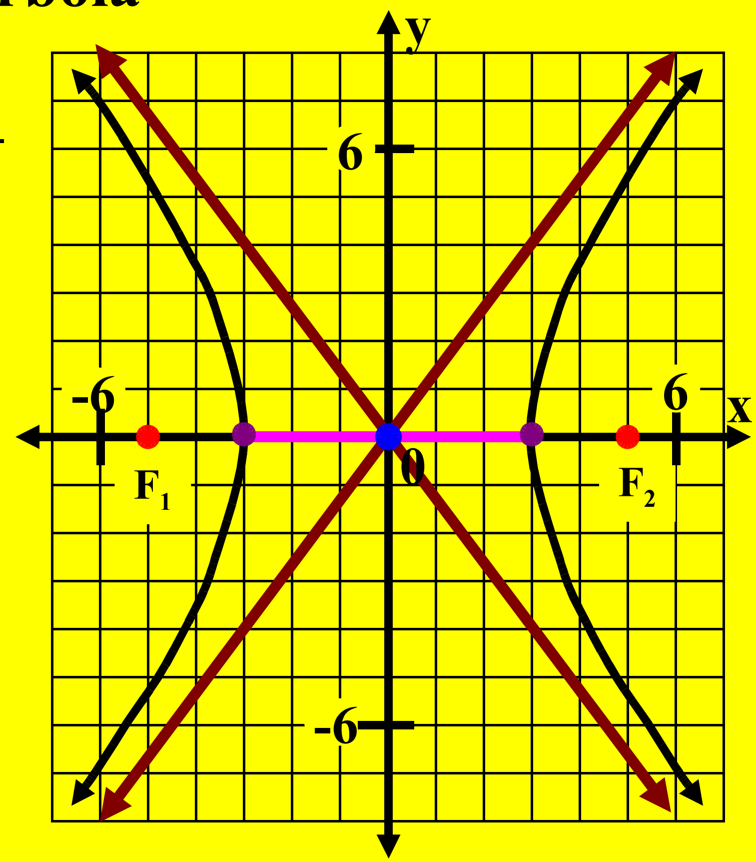

Next consider the 'left branch' of this hyperbola.

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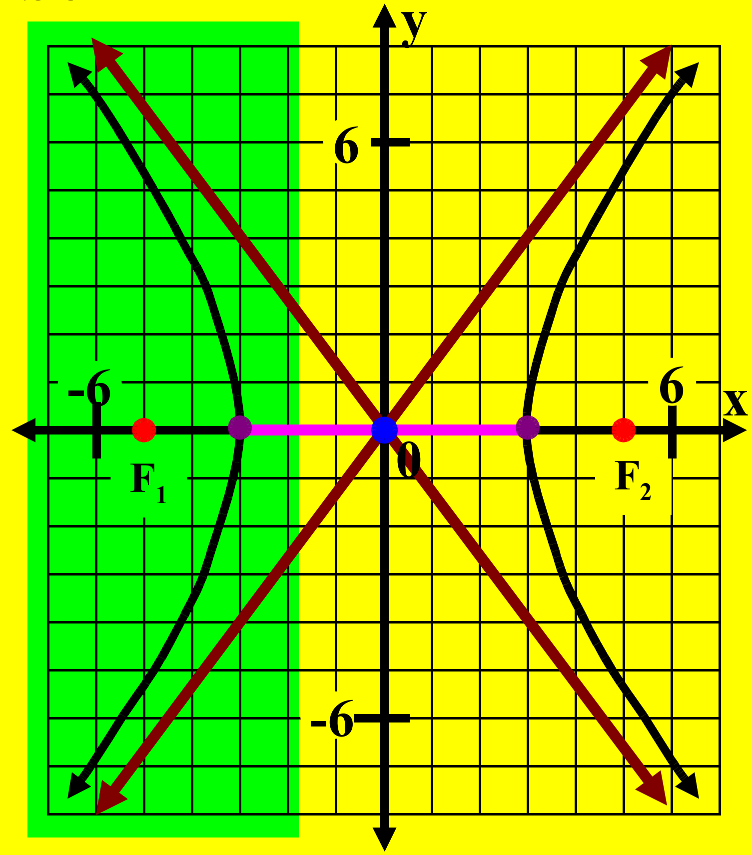

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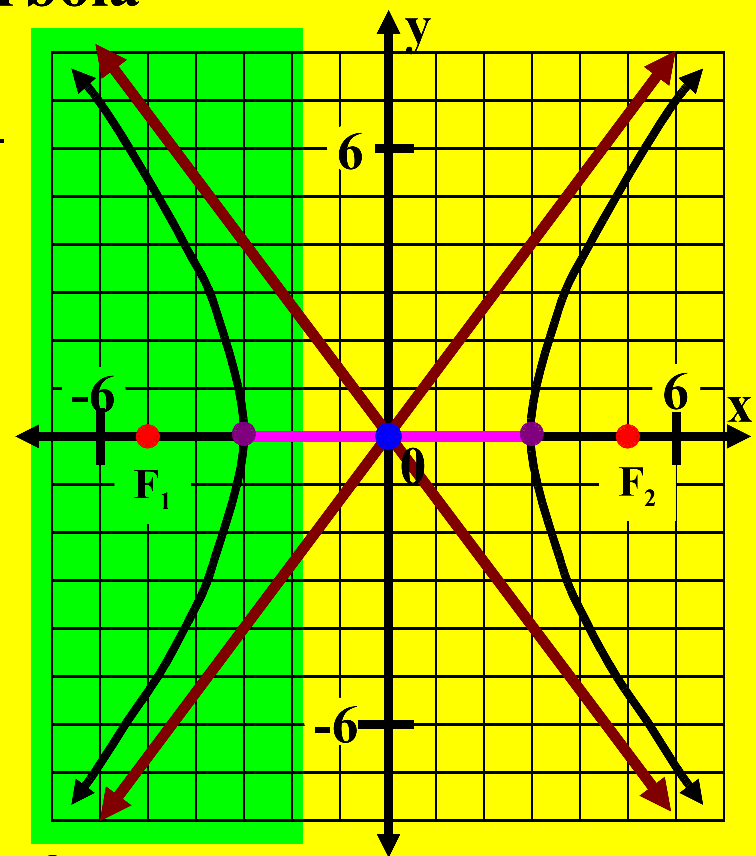

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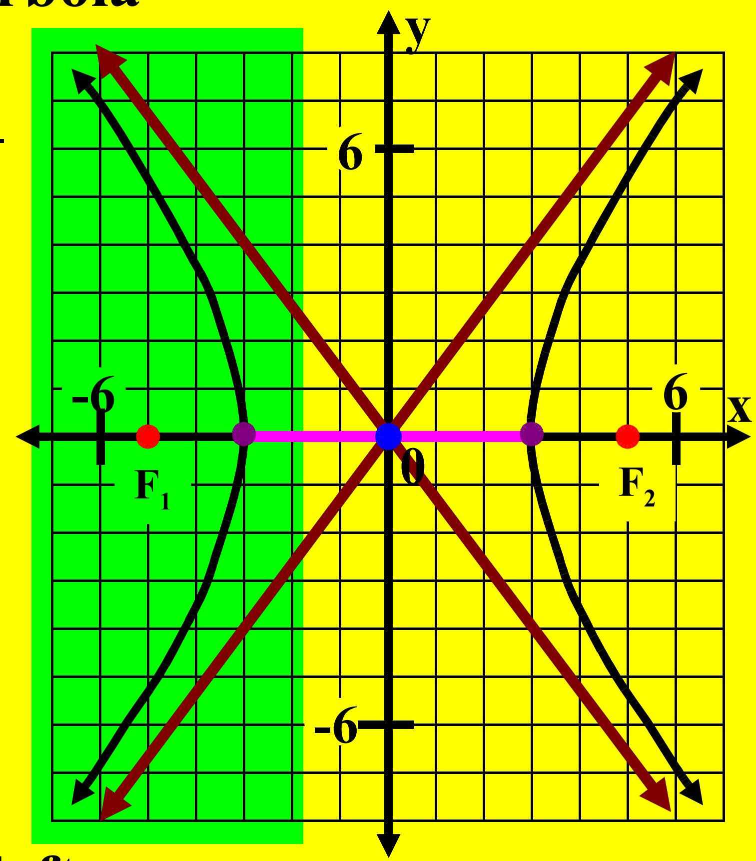

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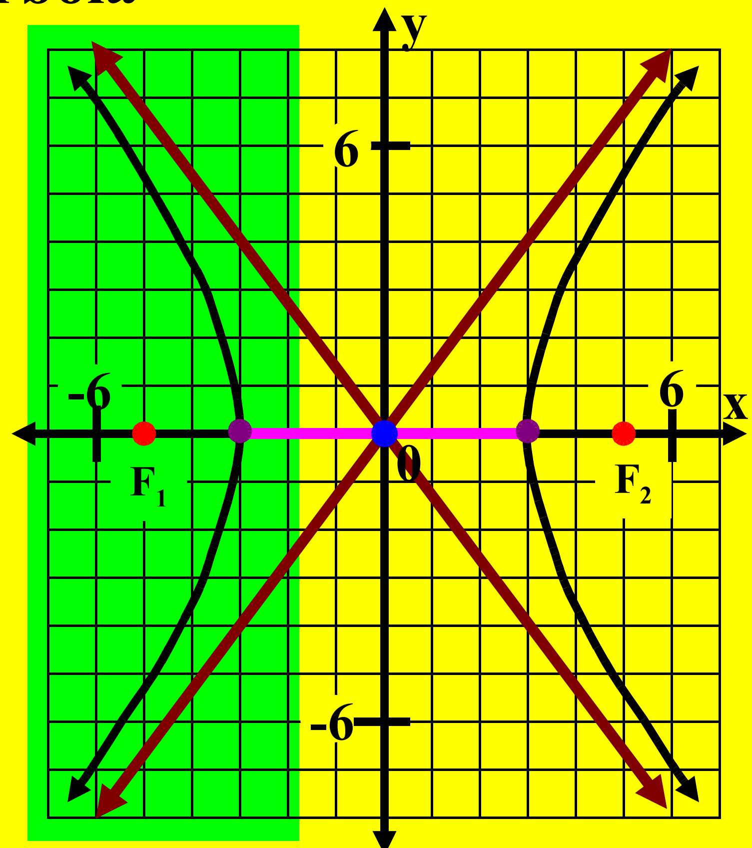

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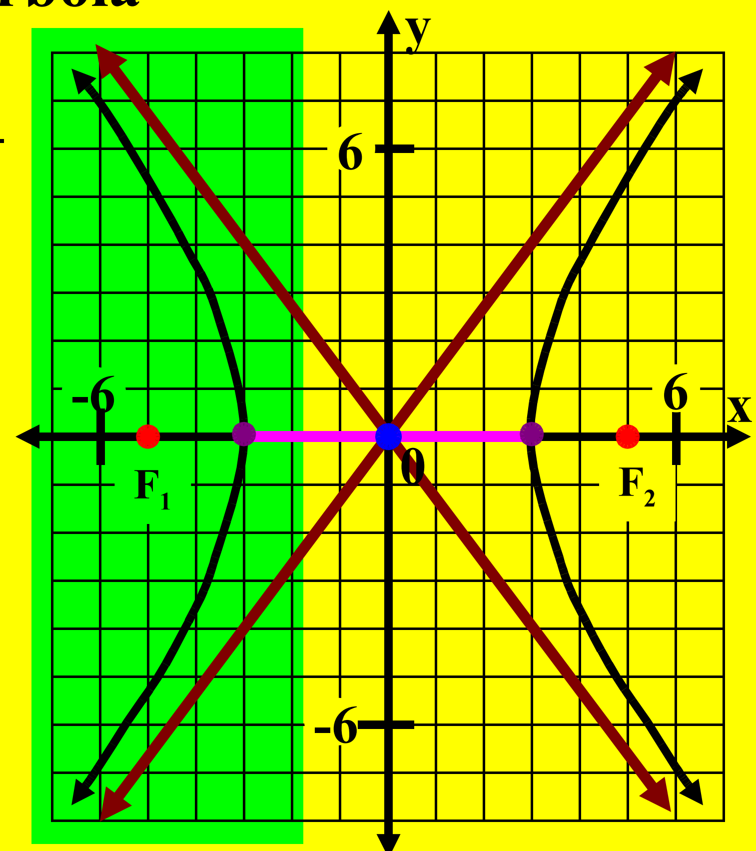

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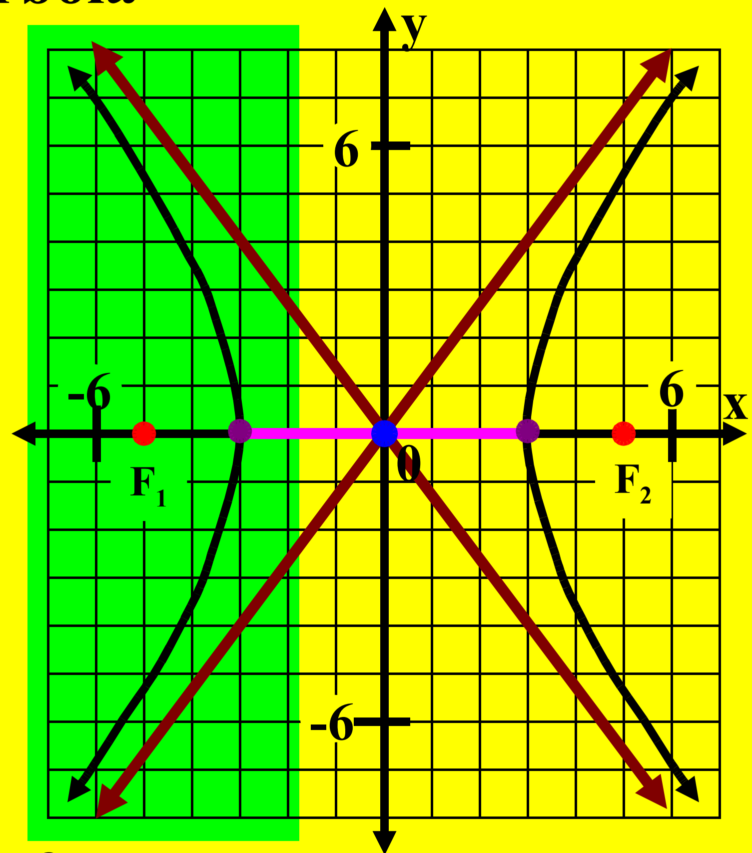

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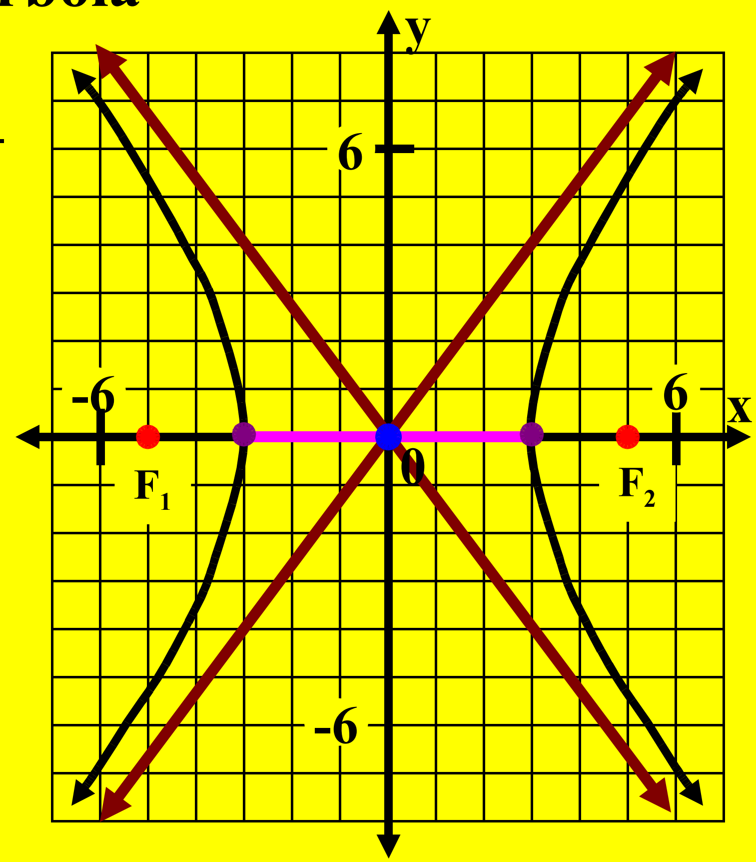

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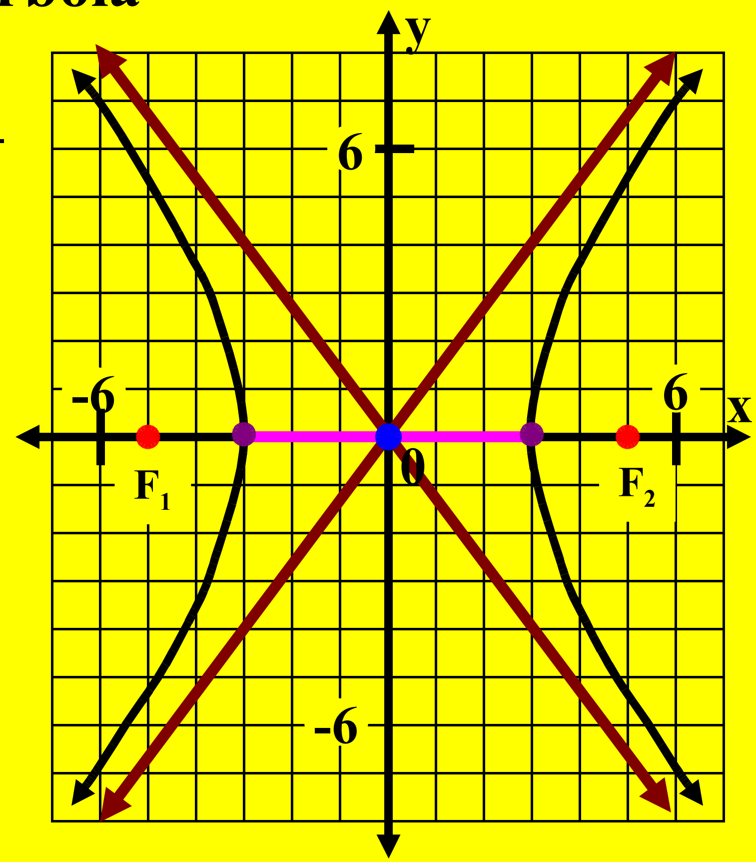

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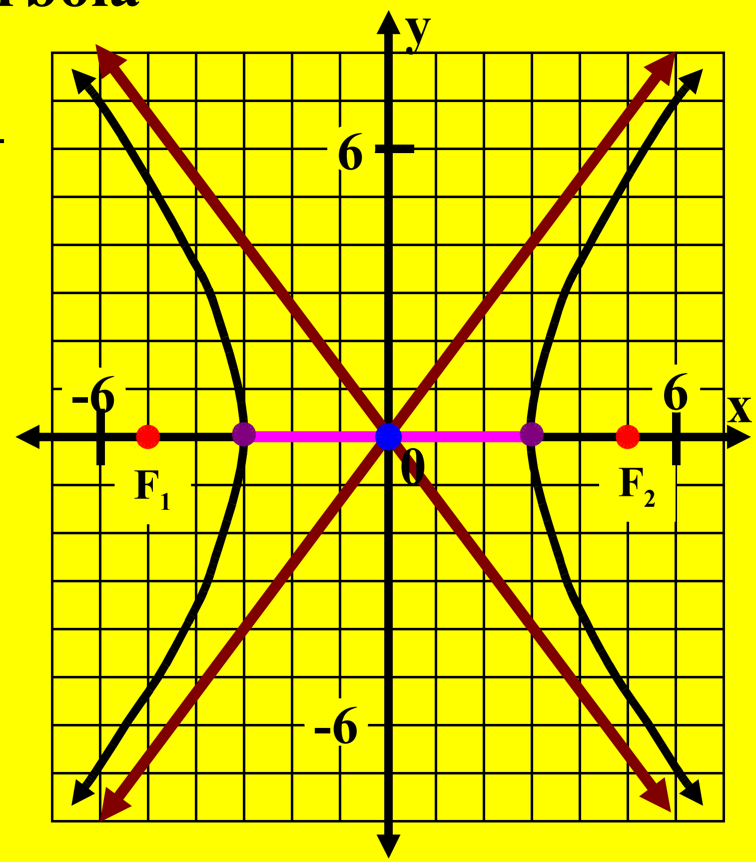

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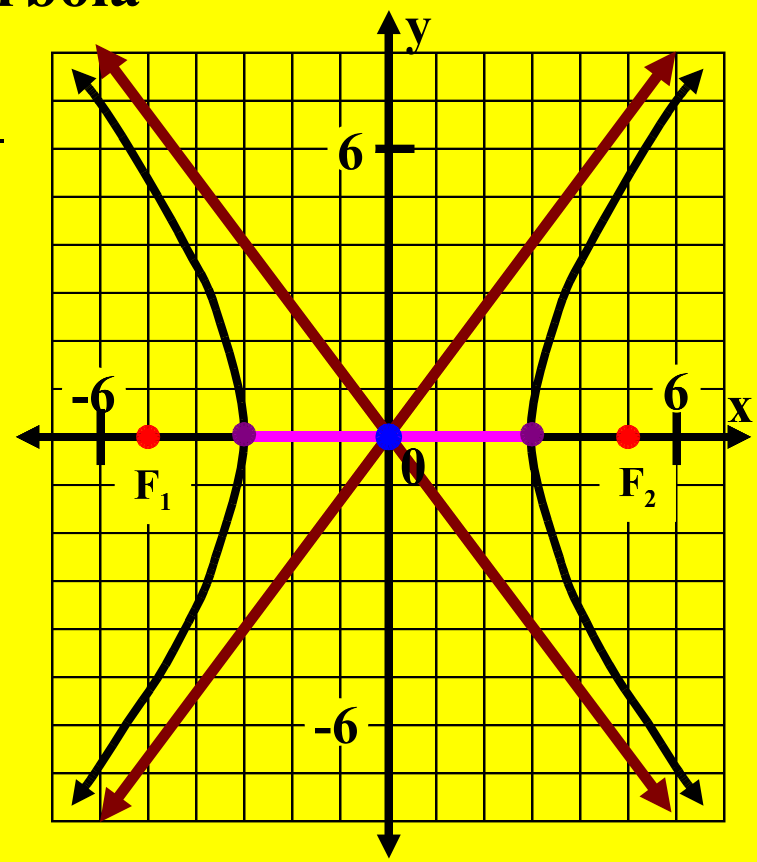

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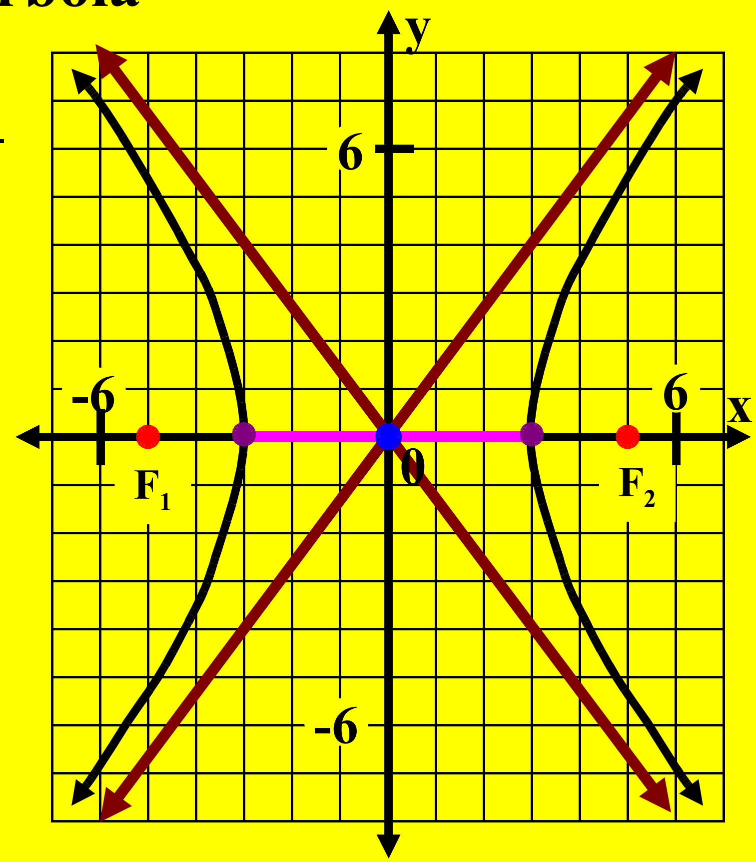

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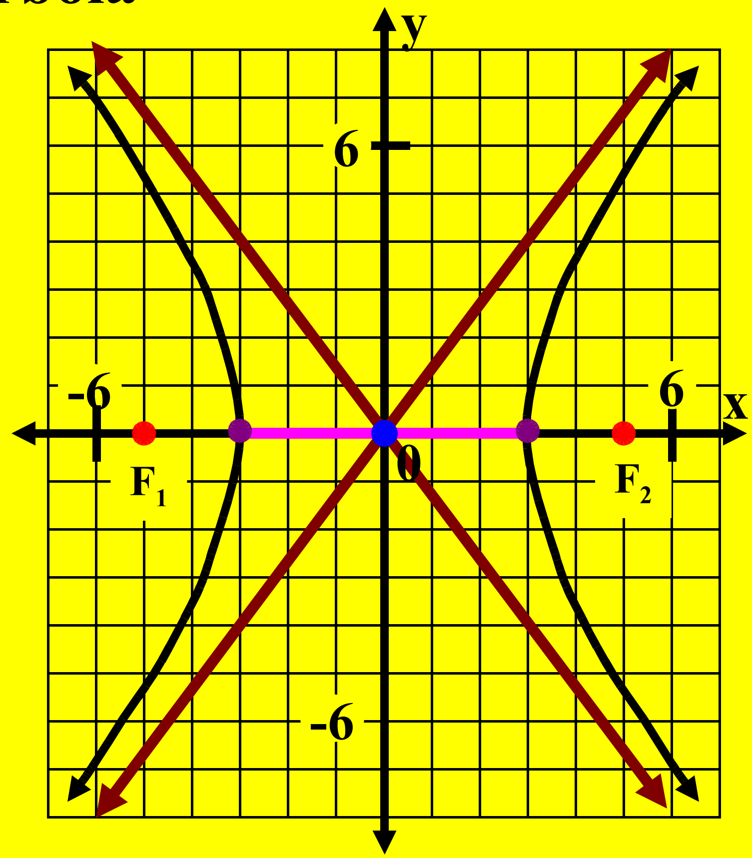

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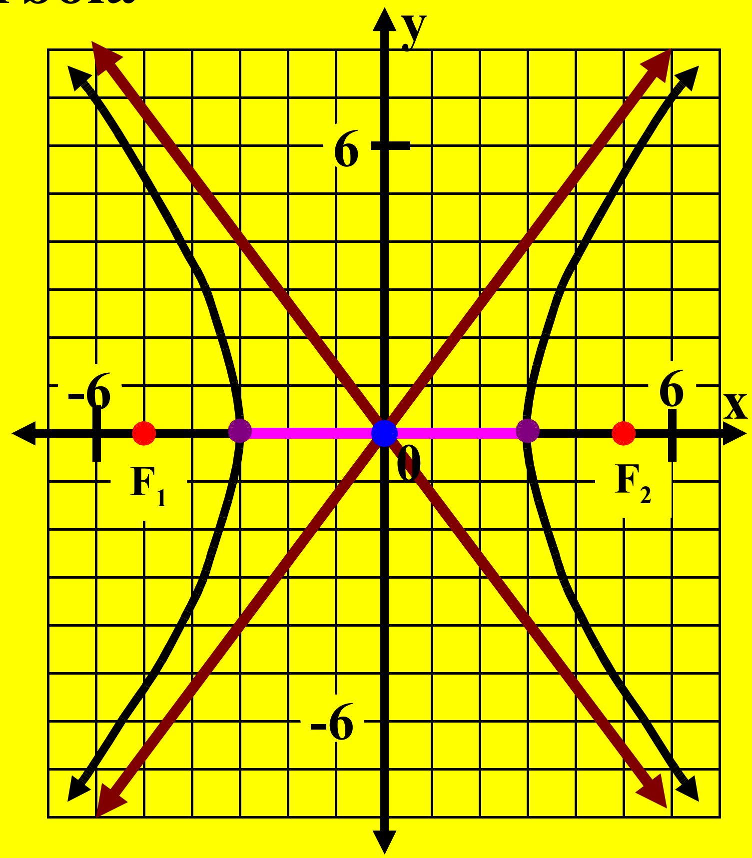

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If P(x, y) represents <u>any point on the hyperbola</u>, then

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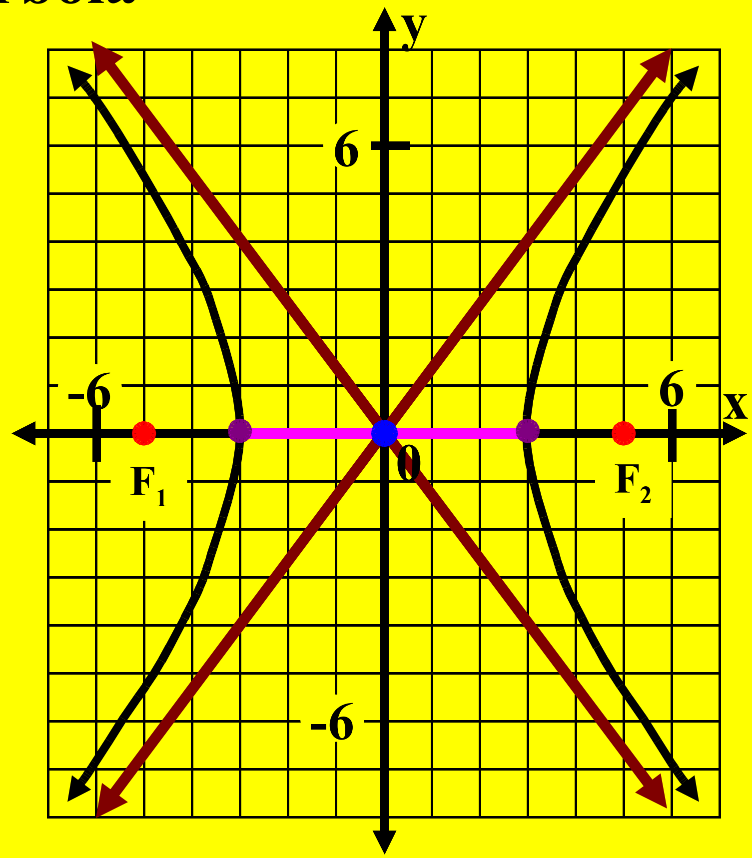
Standard Form Equation

This is an example of a 'type 1' hyperbola.



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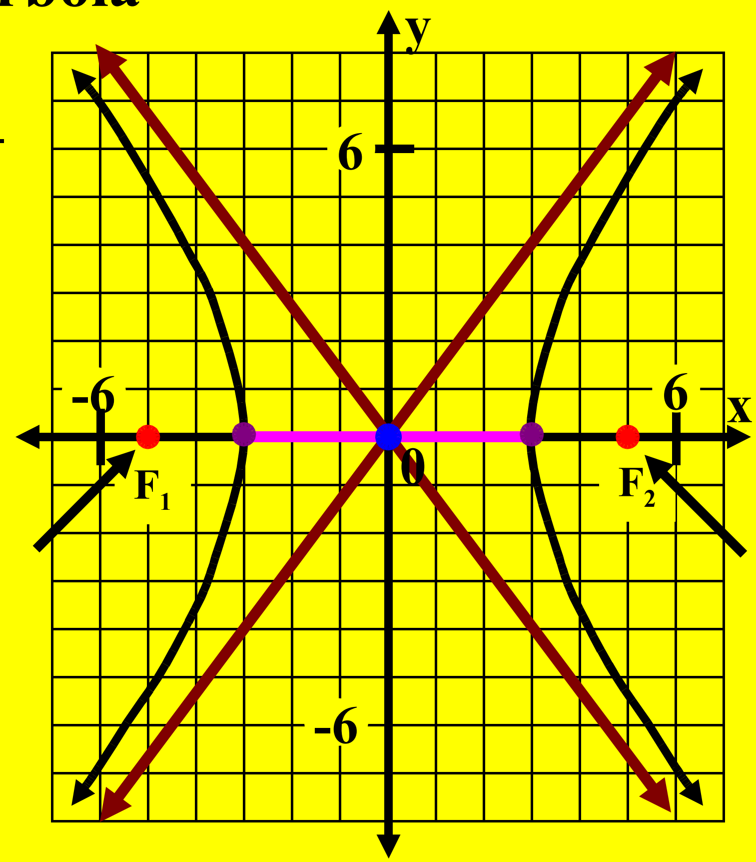

This is an example of a 'type 1' hyperbola. The foci

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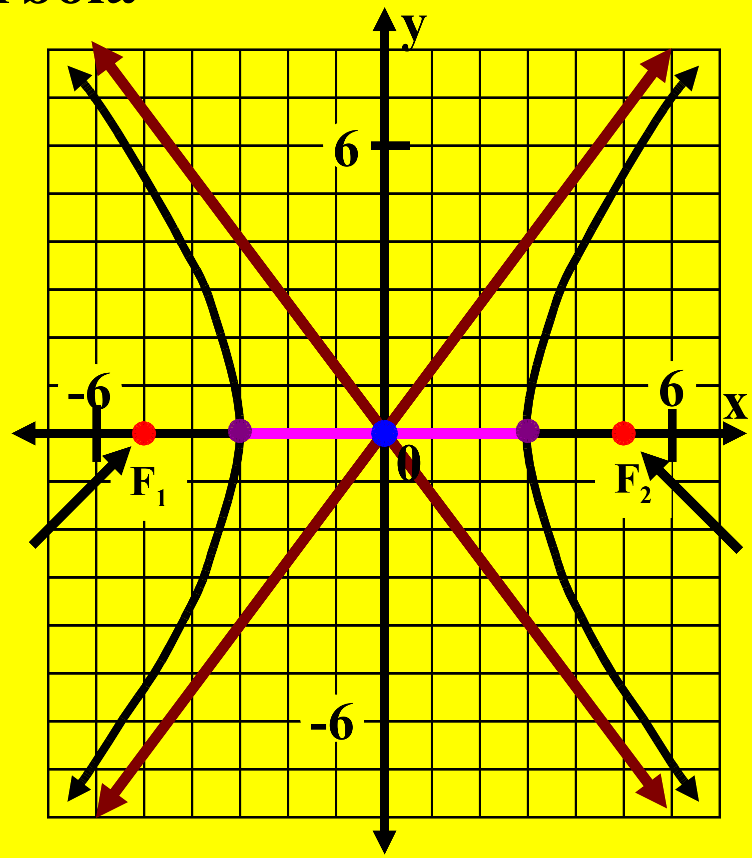

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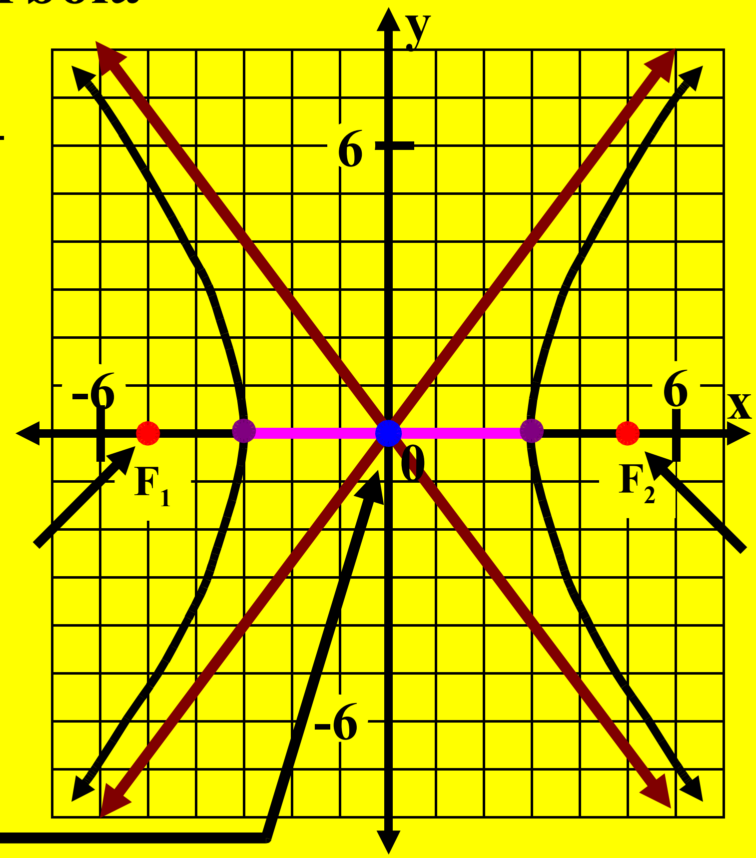

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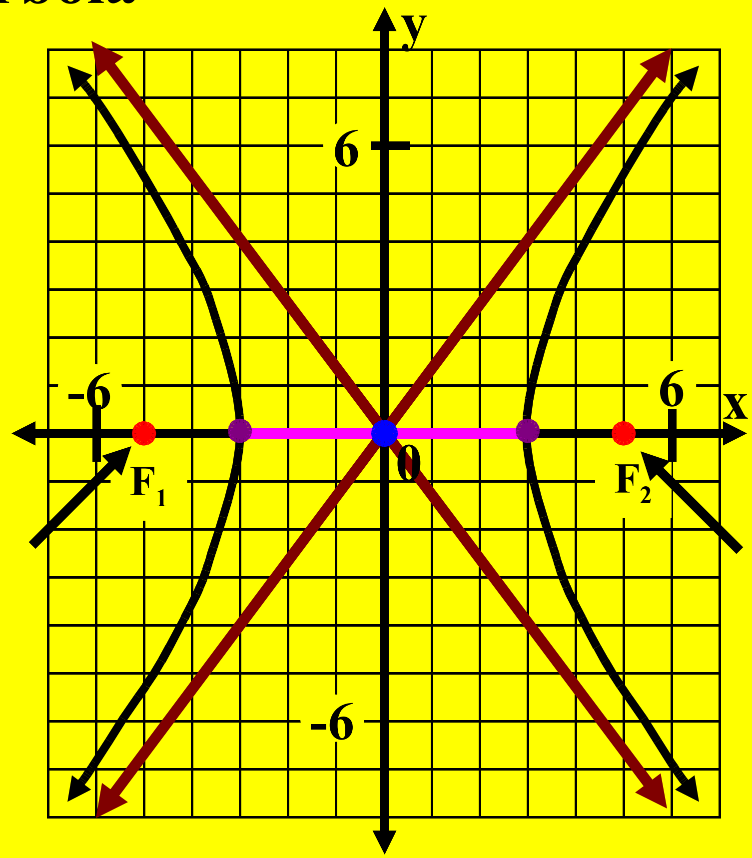

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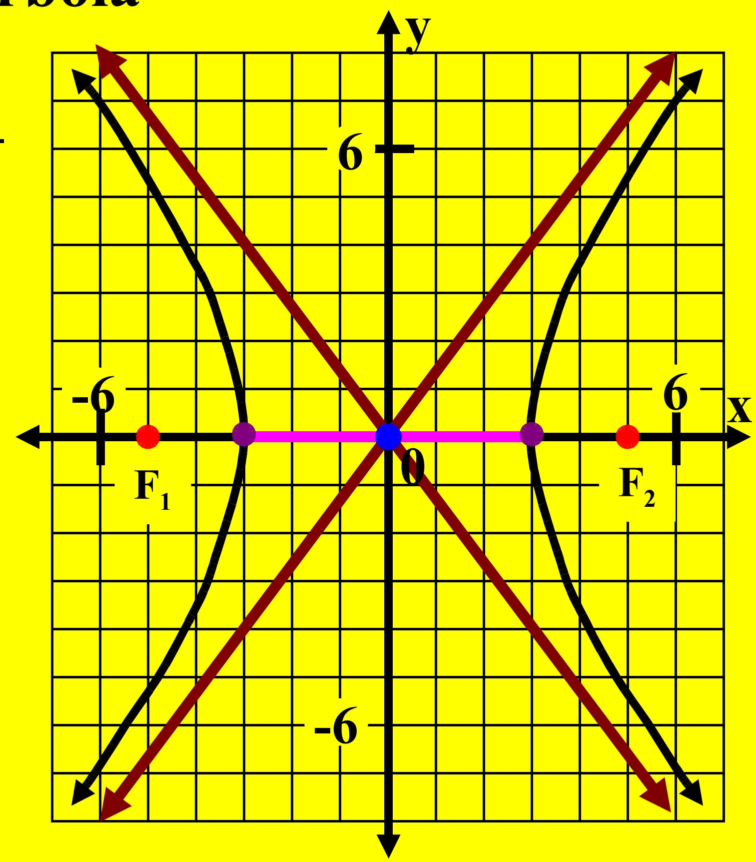
$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$



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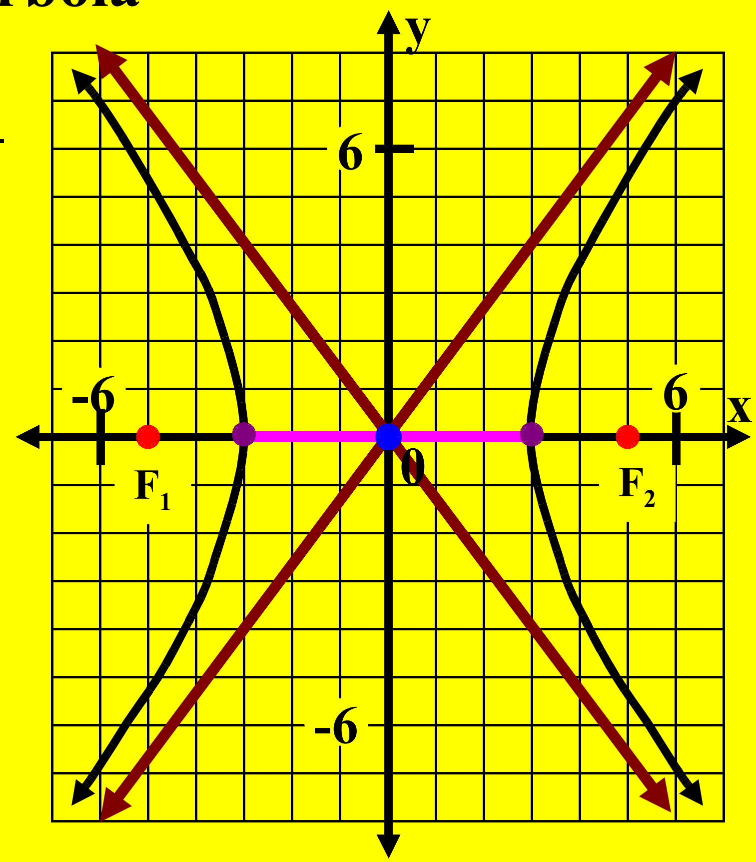

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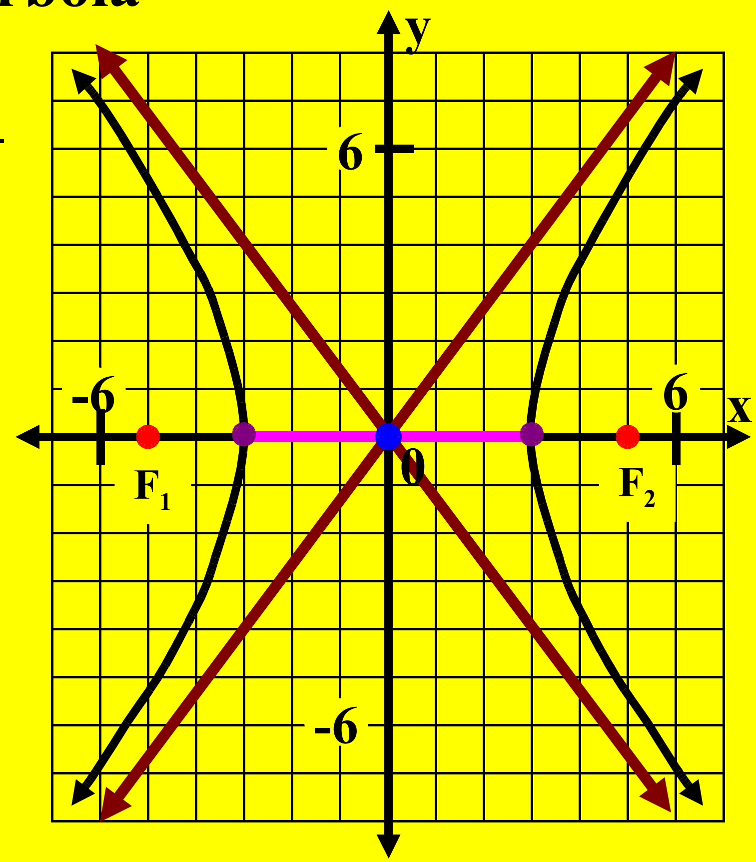

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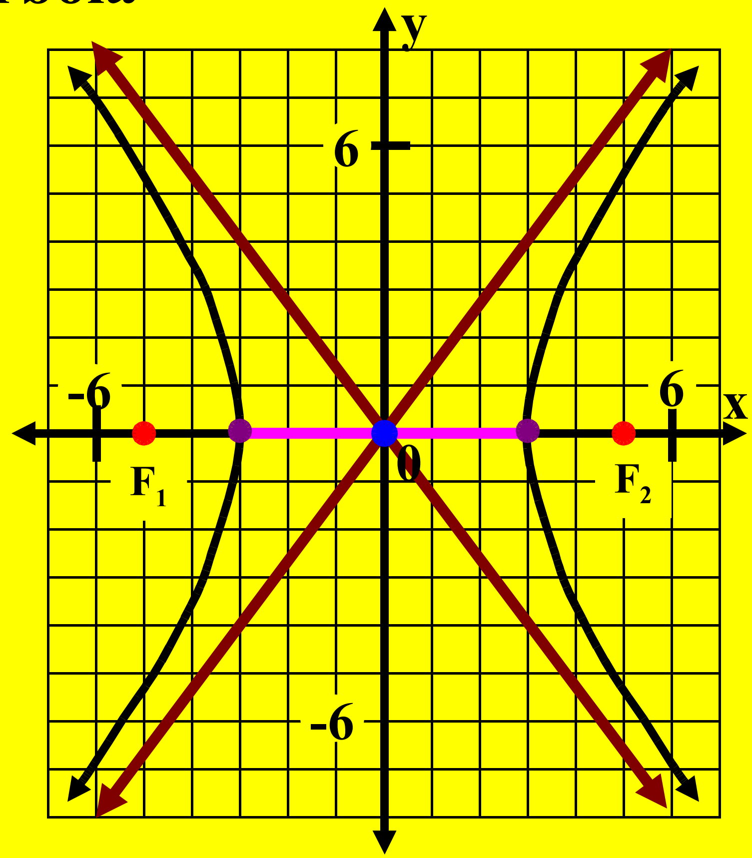

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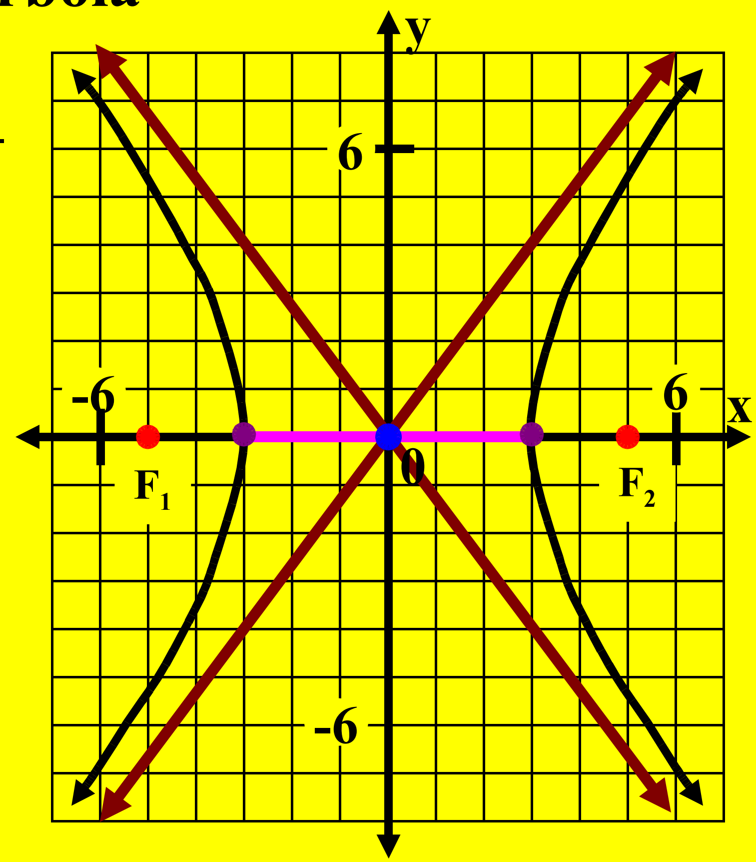

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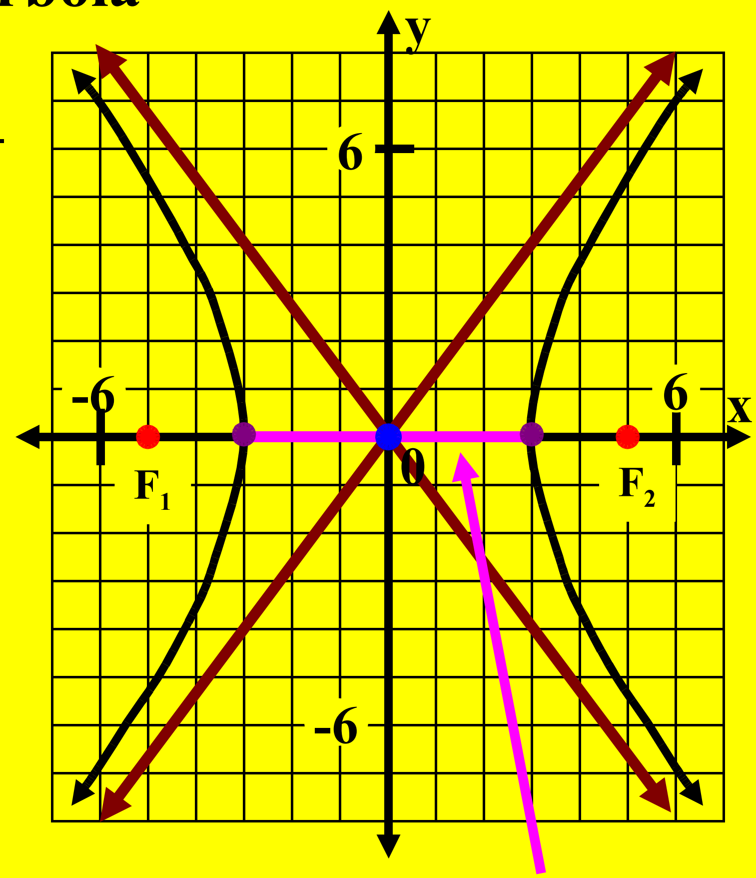

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As we have said previously, the transverse axis

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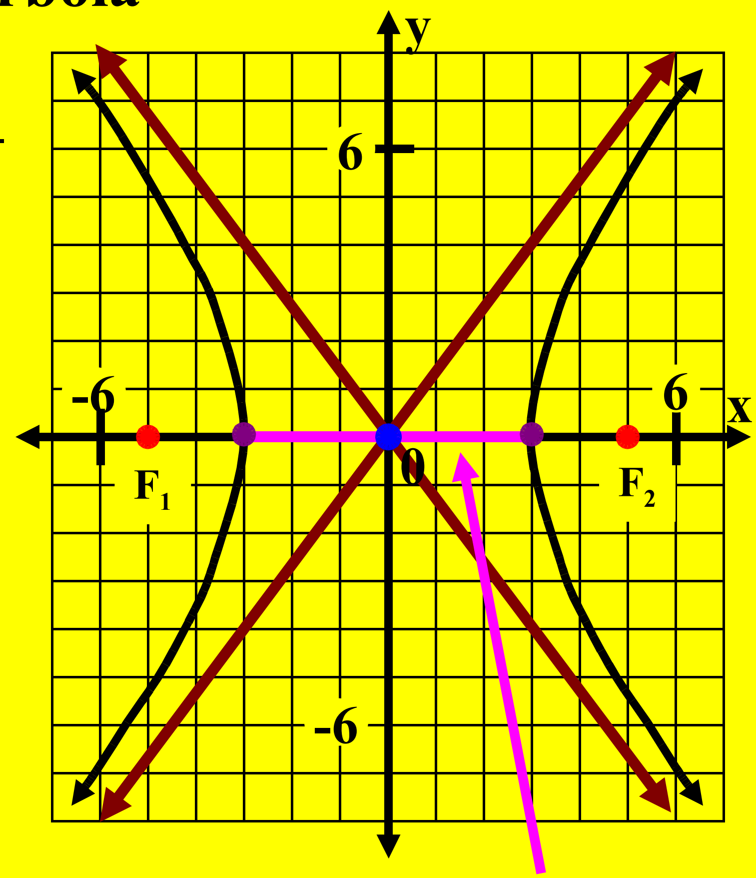

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As we have said previously, the transverse axis is the horizontal line segment through the center

Equations of a Hyperbola

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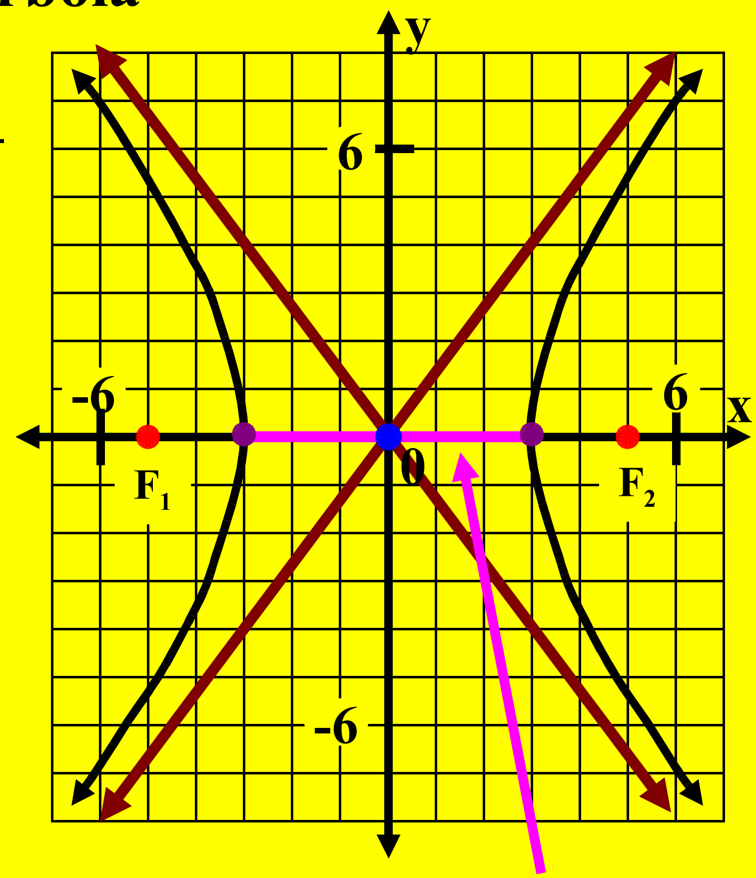

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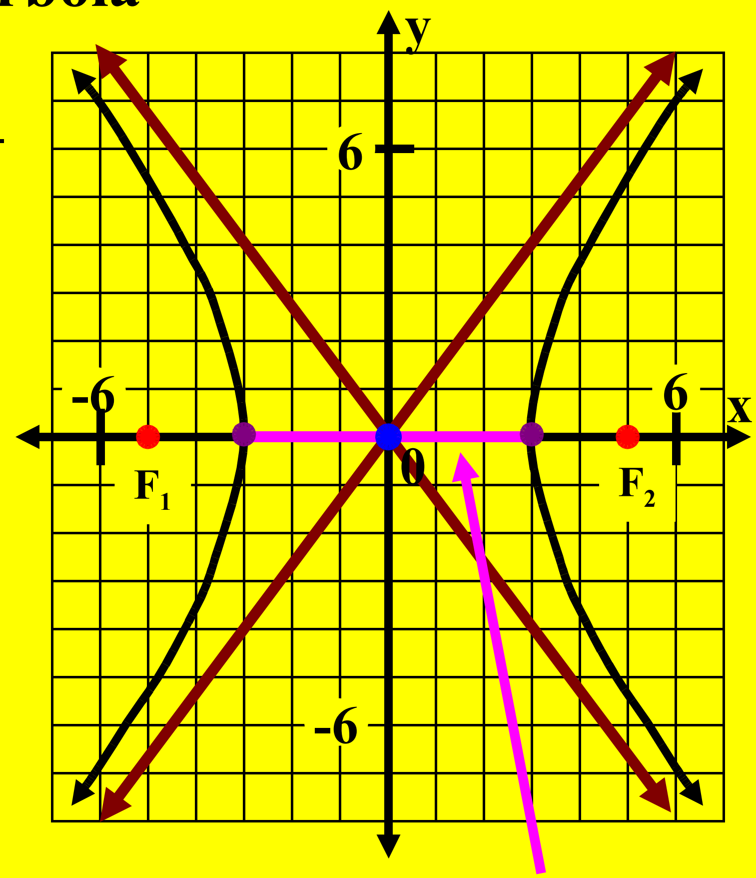

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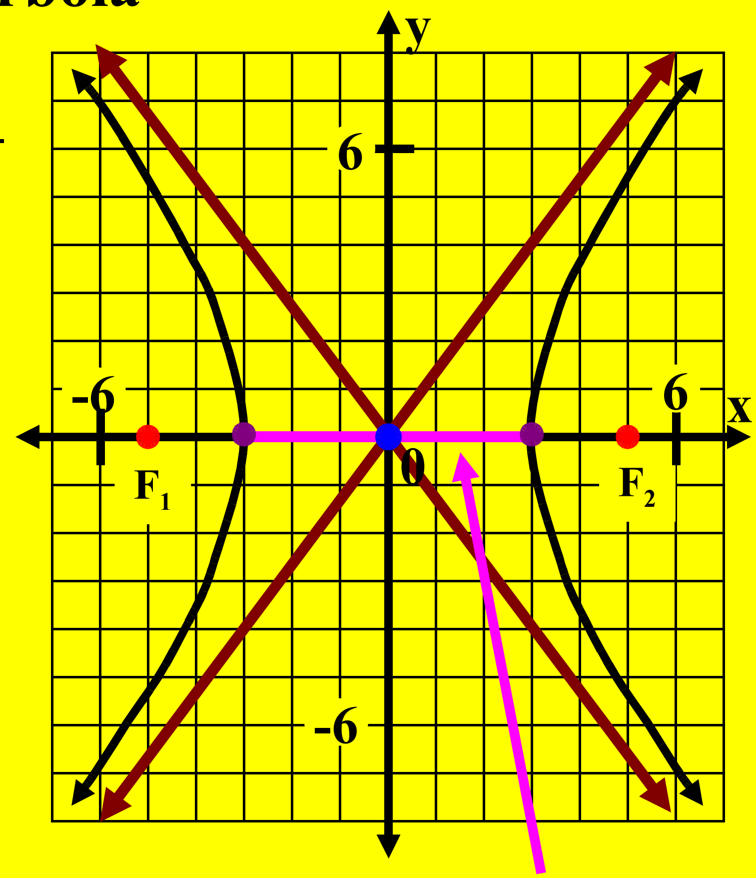

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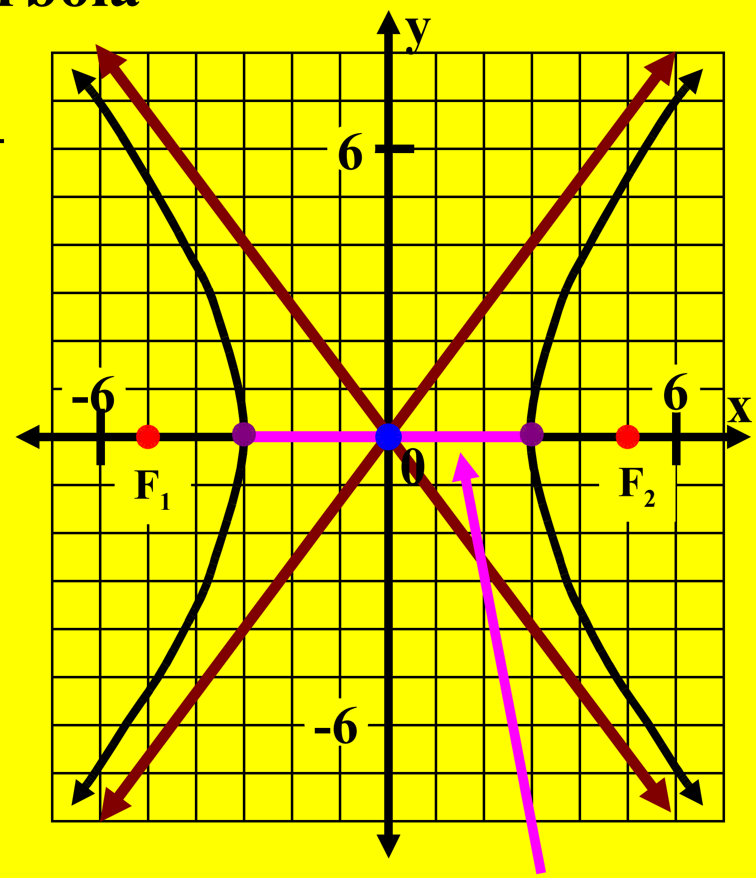

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Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

$$\frac{x^2}{\boxed{9}} - \frac{y^2}{16} = 1$$

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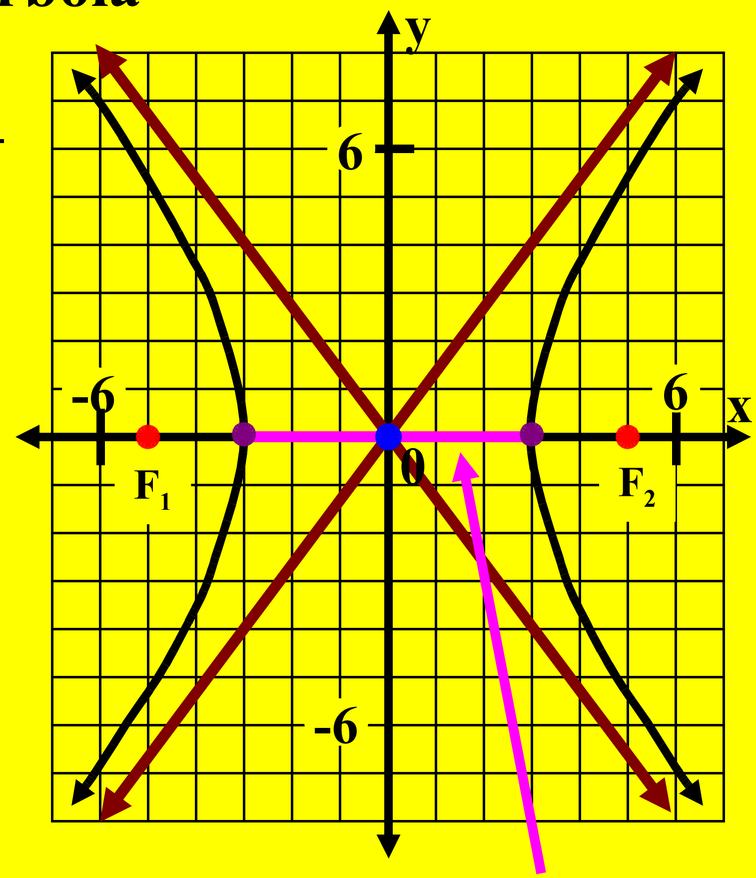

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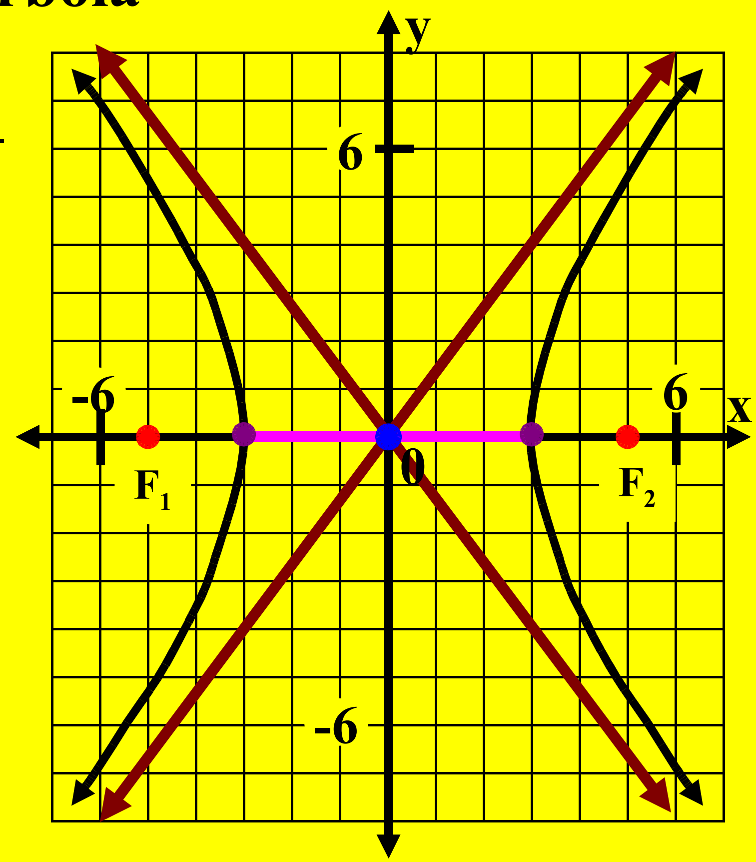

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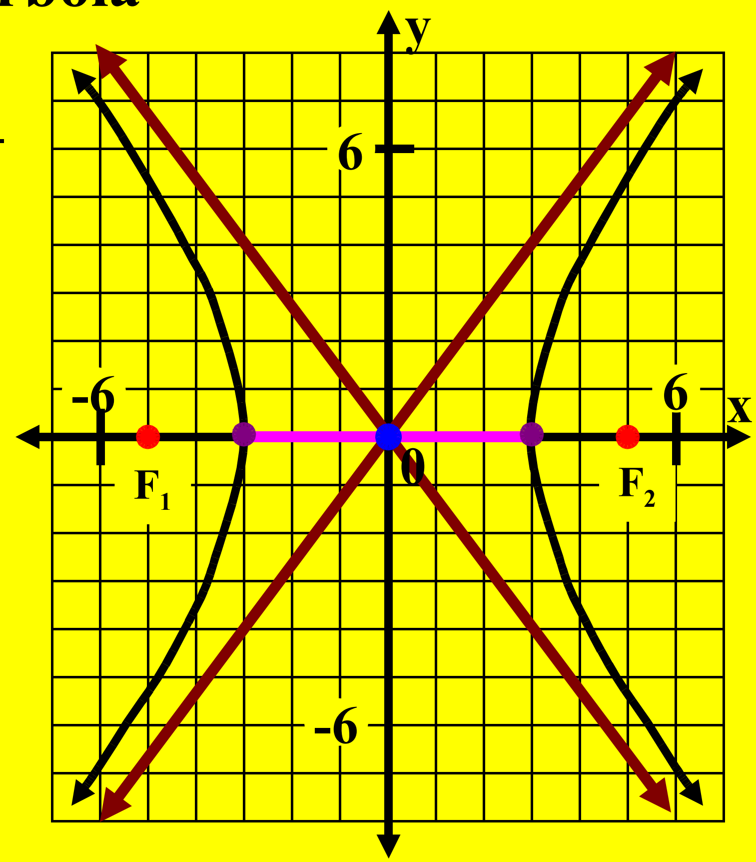

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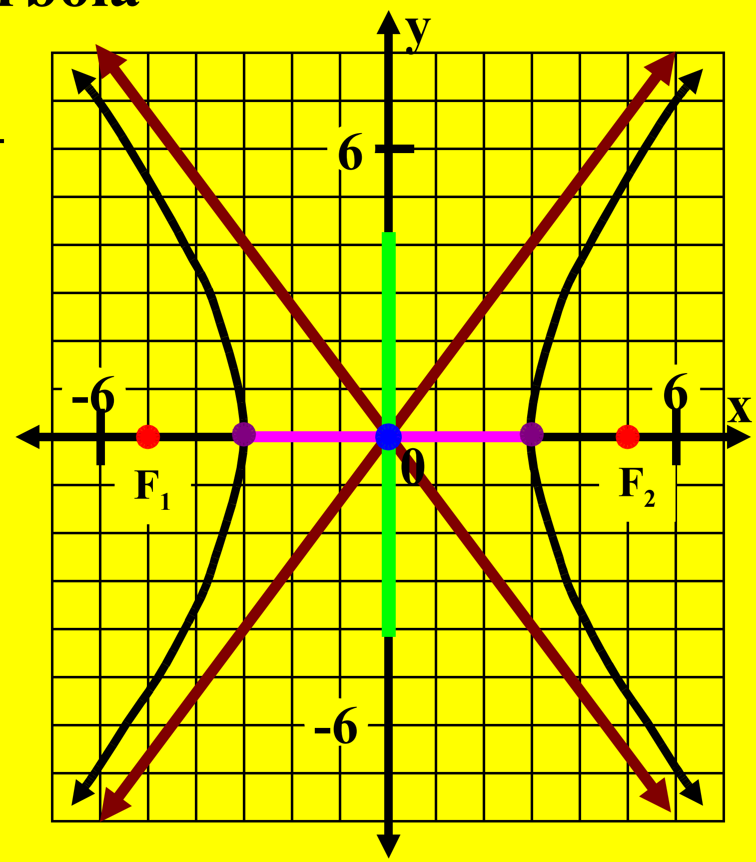

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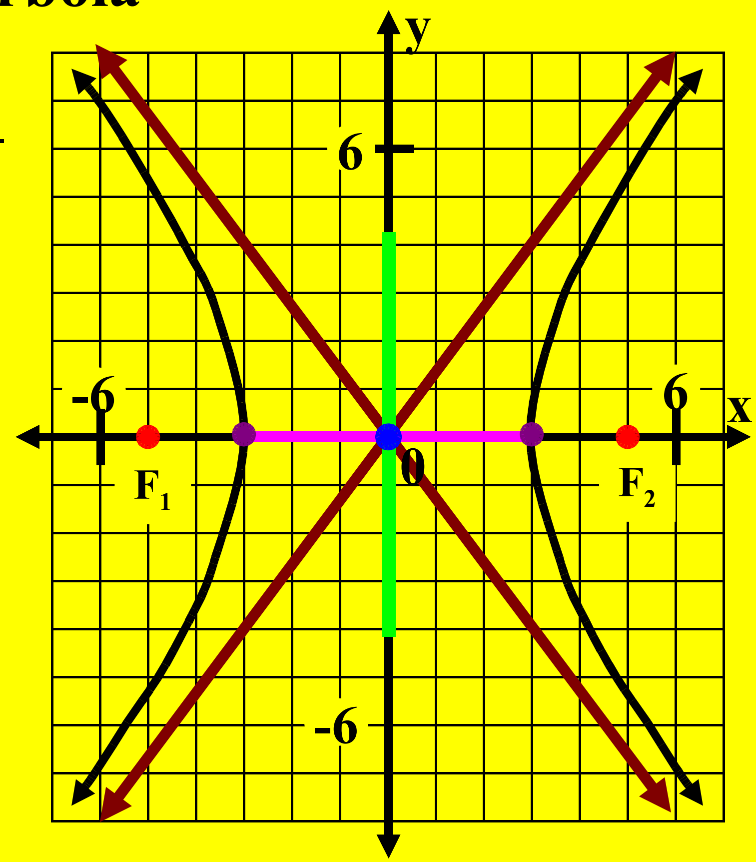

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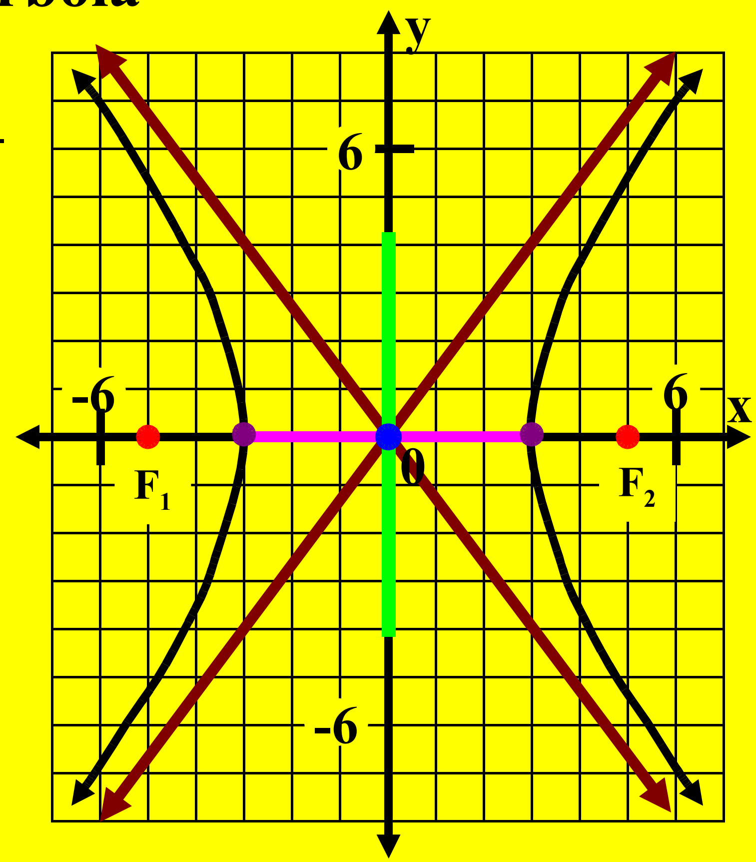

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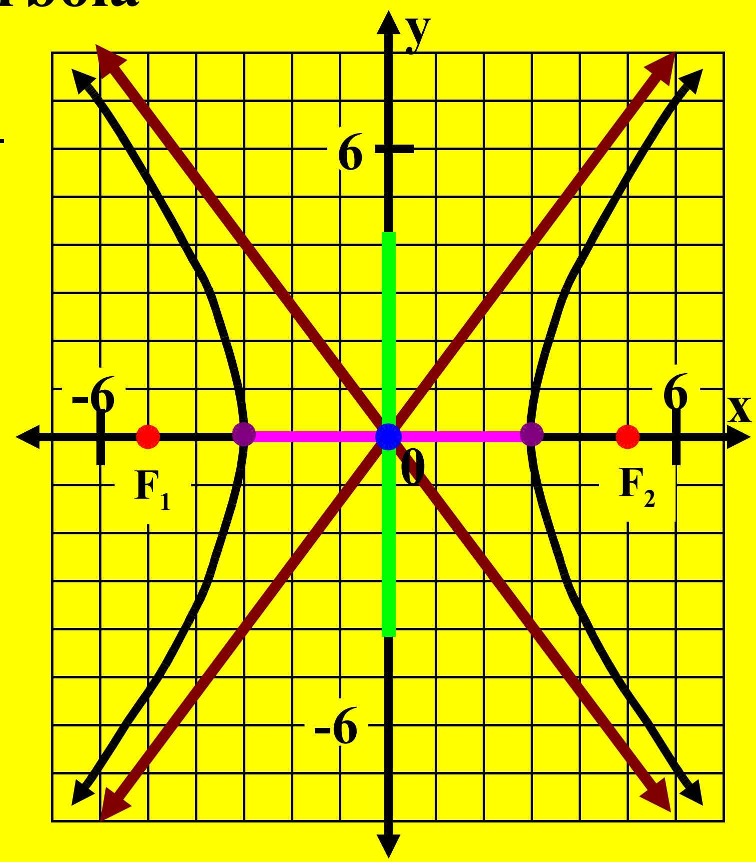

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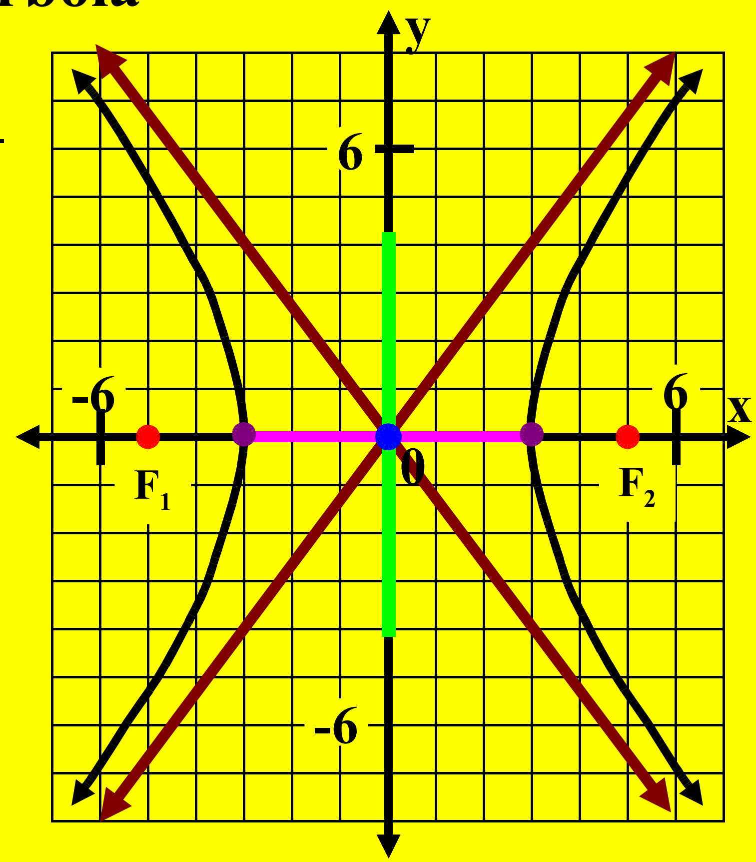

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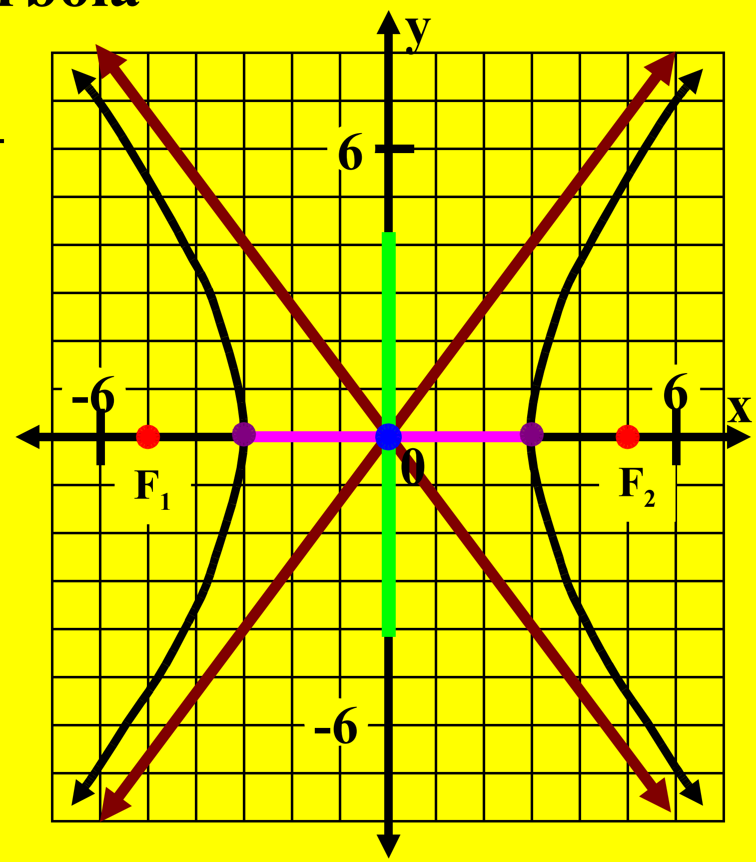

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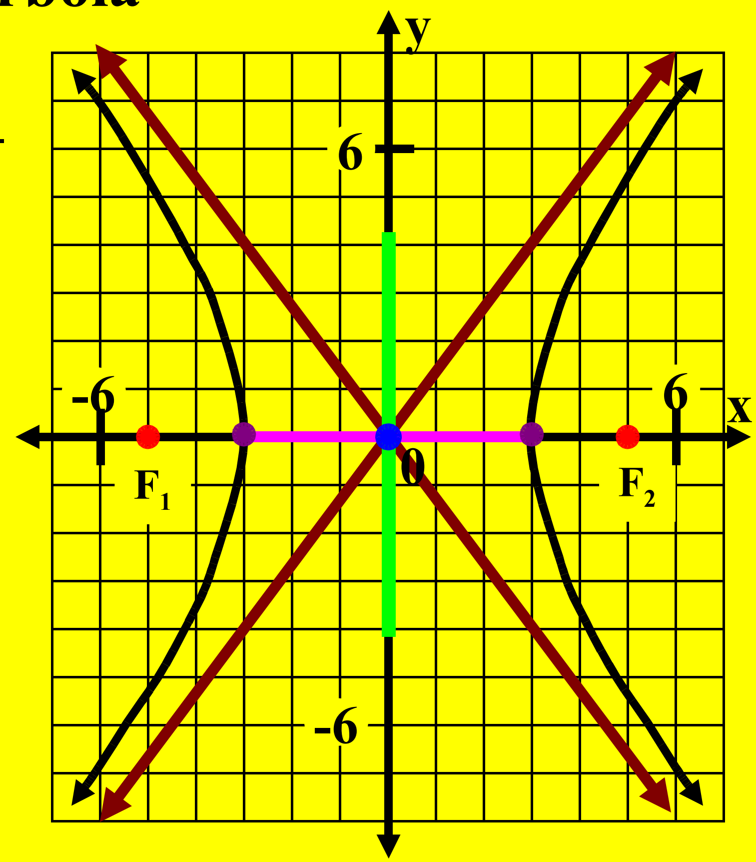

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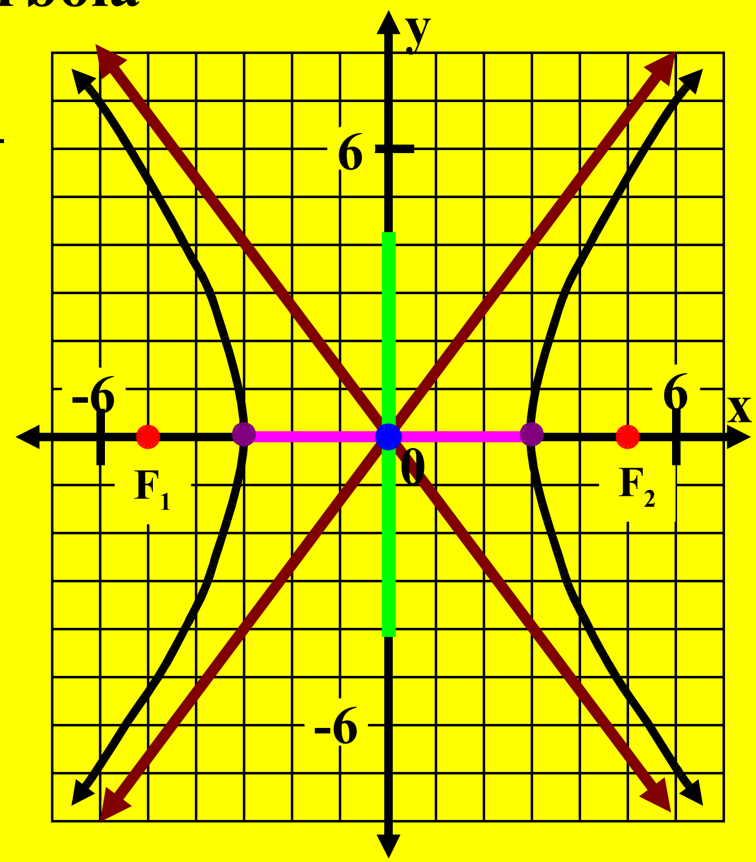

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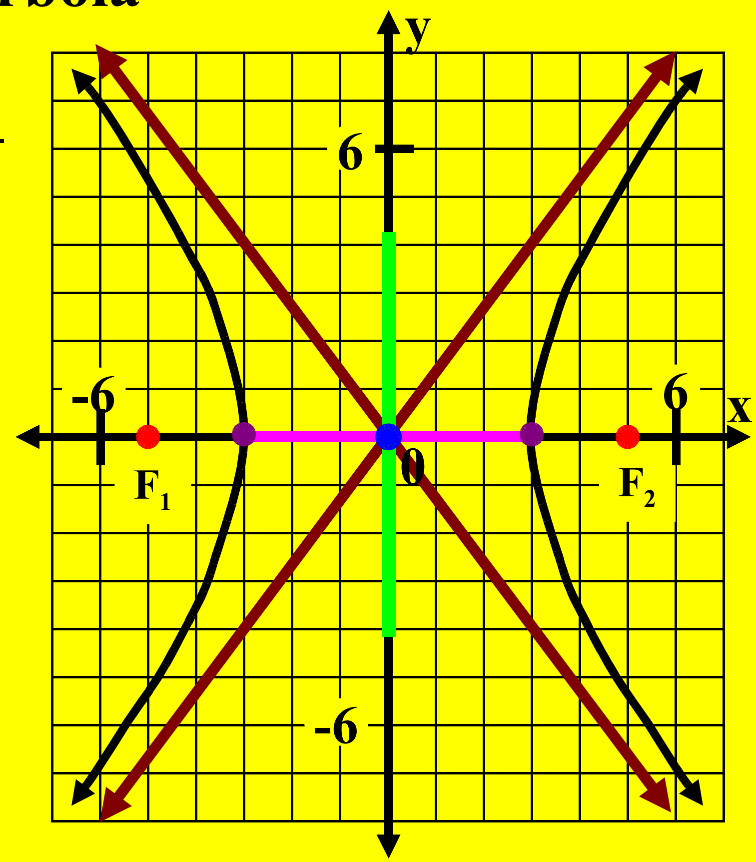

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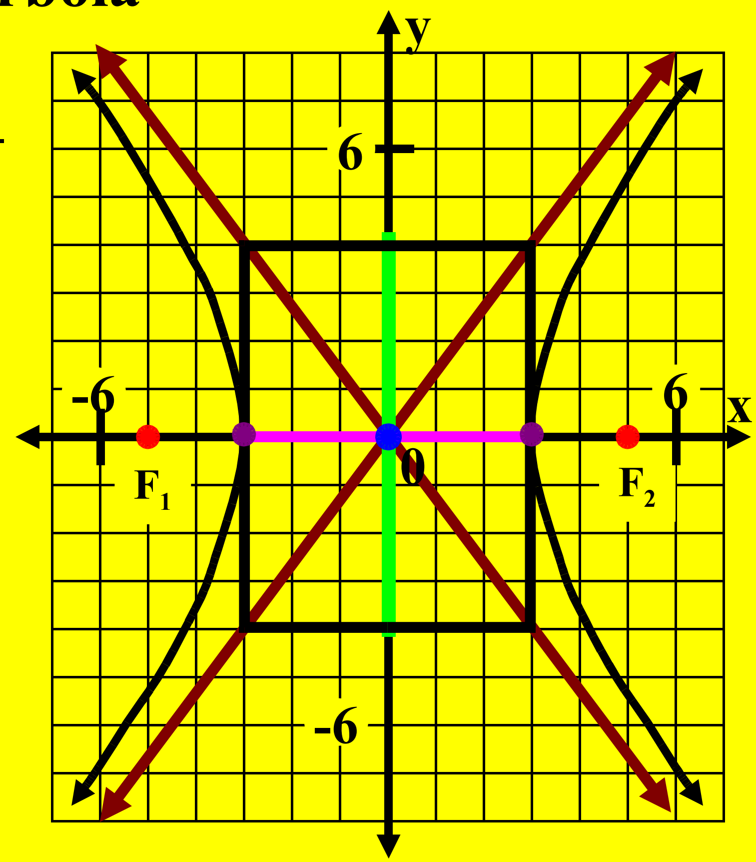

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This rectangle is very useful when graphing hyperbolas.

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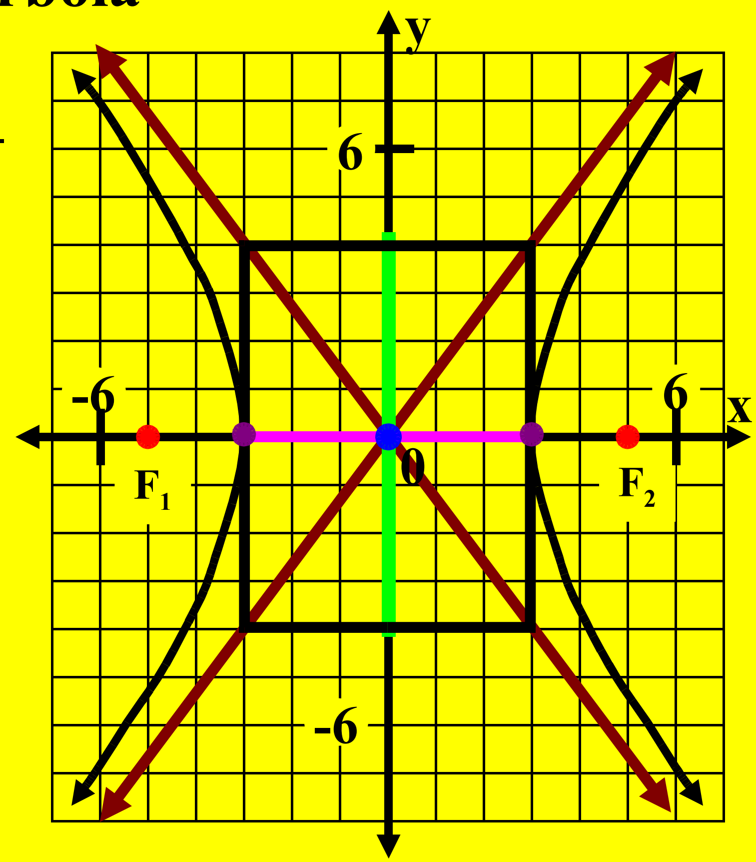

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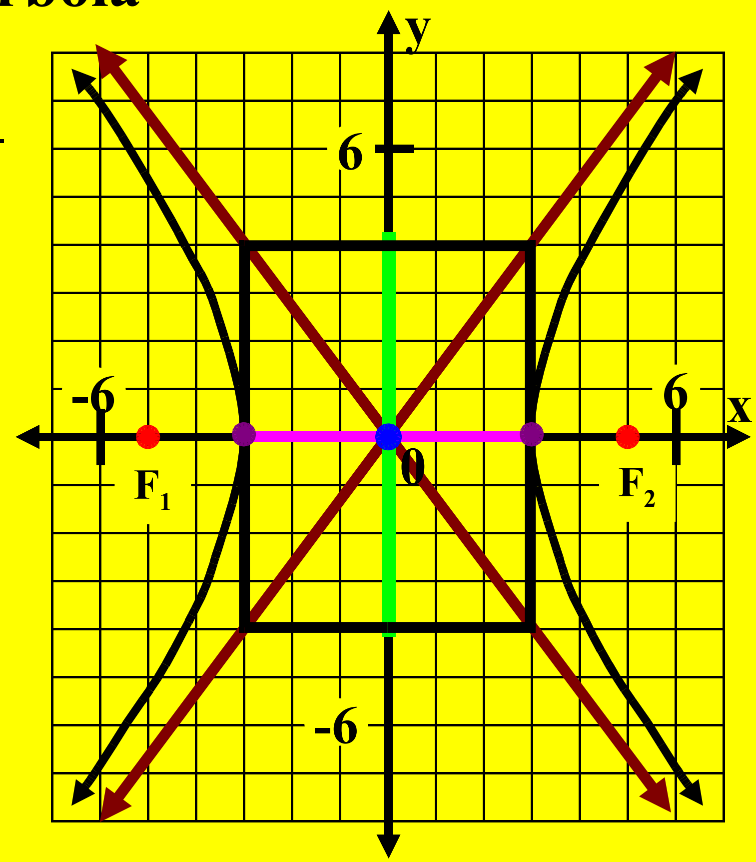

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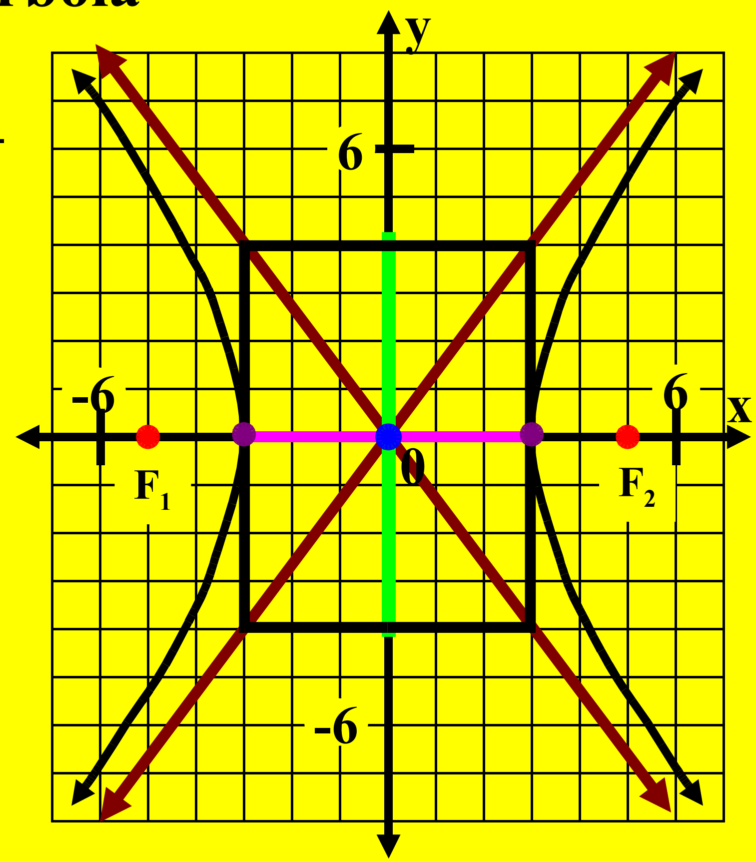

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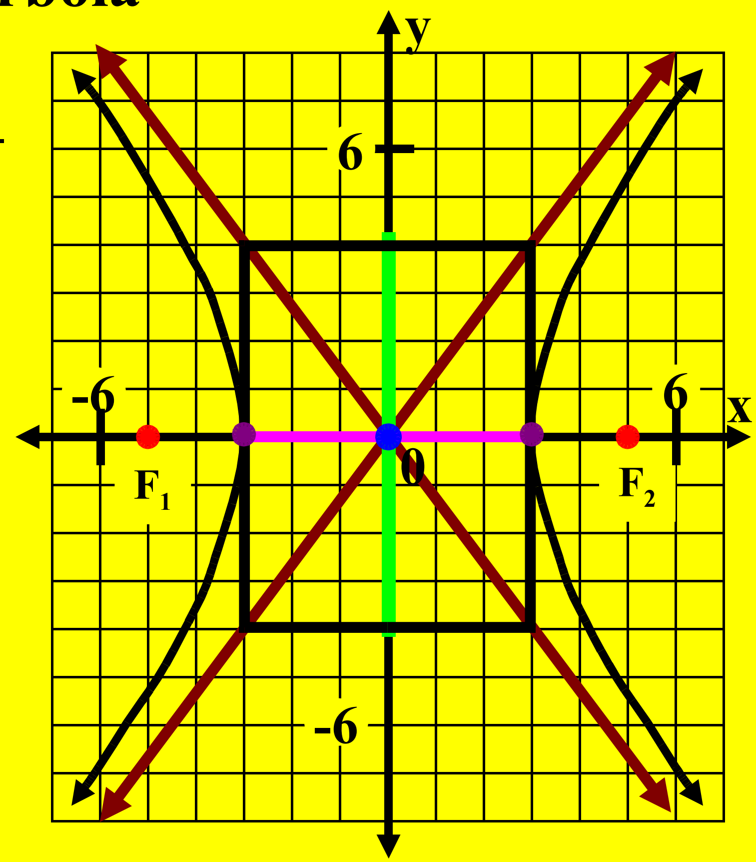

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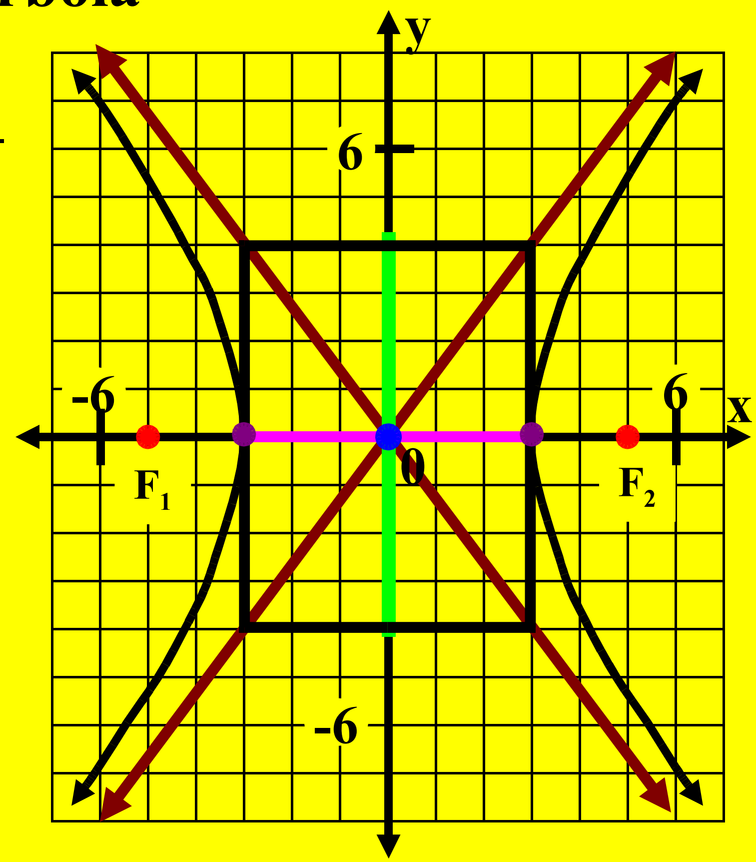

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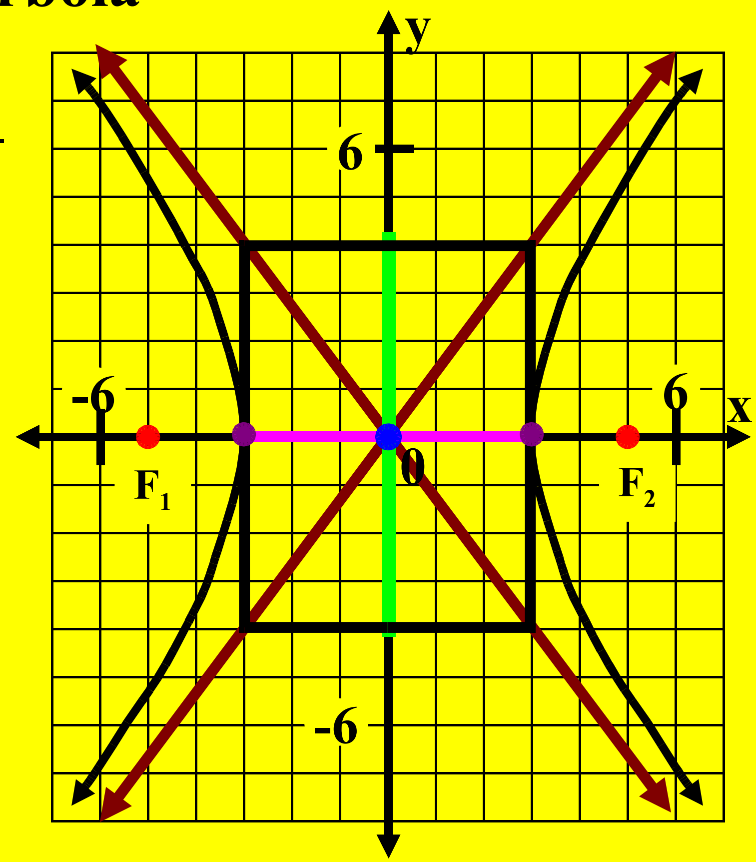

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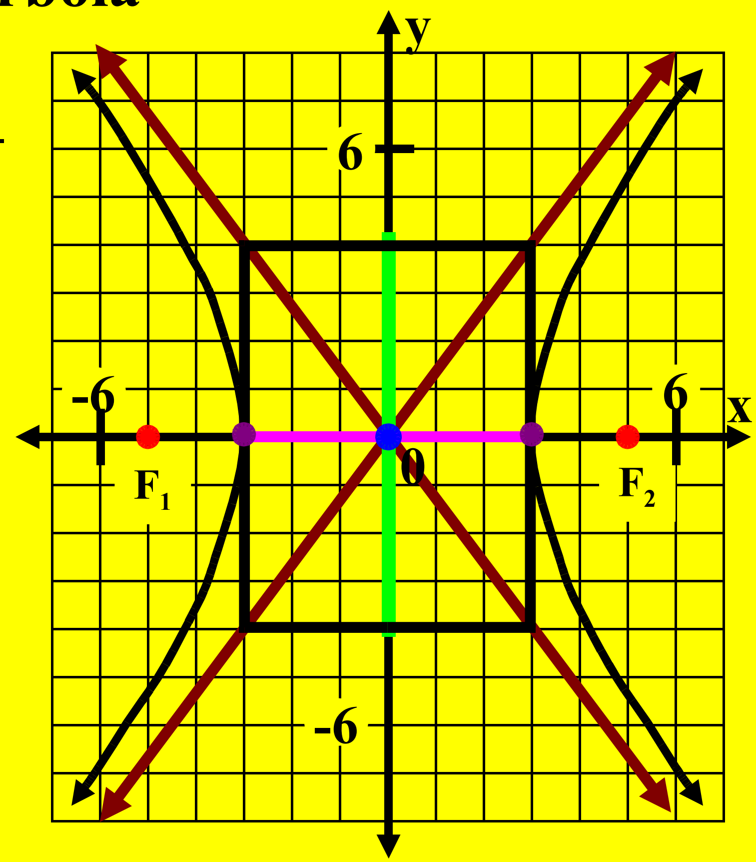

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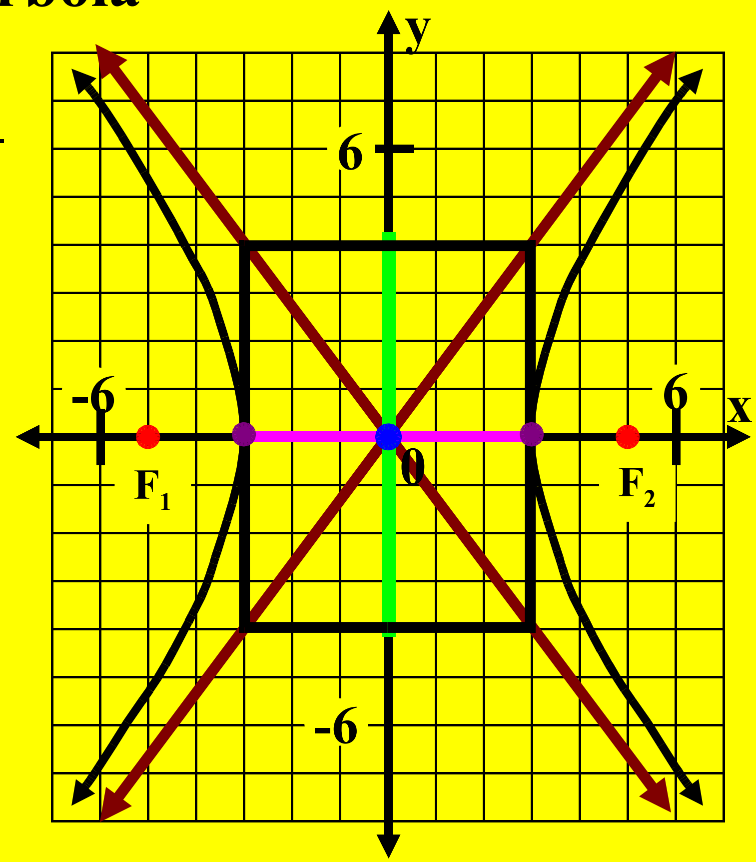

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Most importantly, the diagonals of this rectangle can be used to draw in the two lines that are the asymptotes of the hyperbola.

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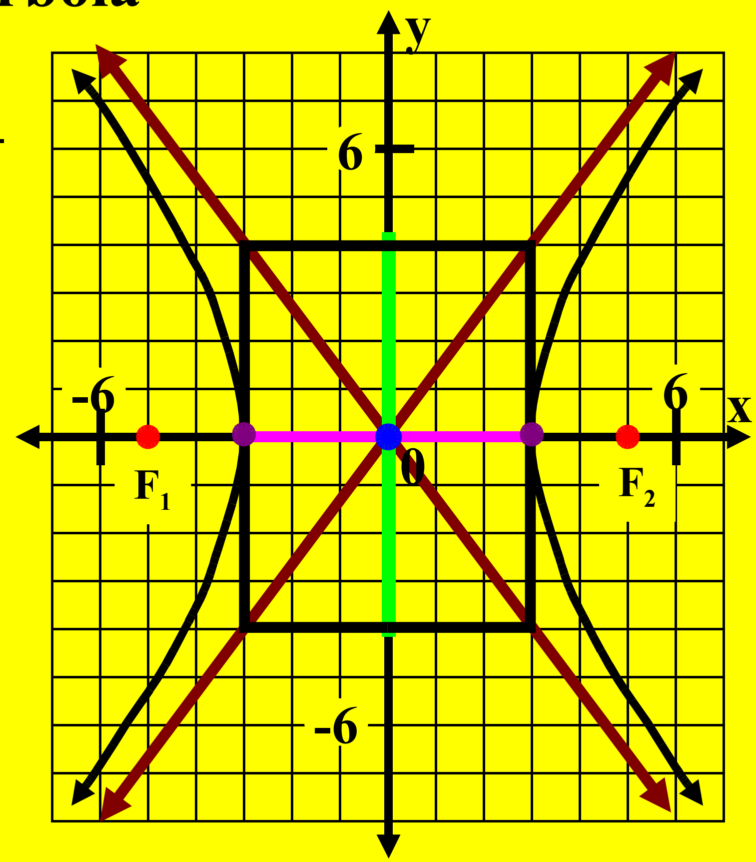

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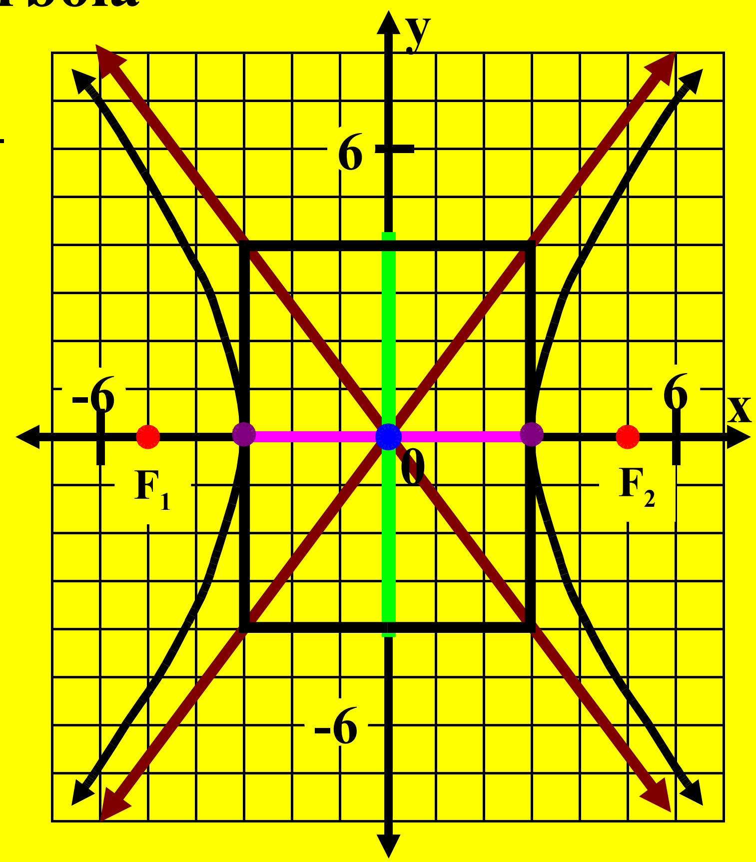

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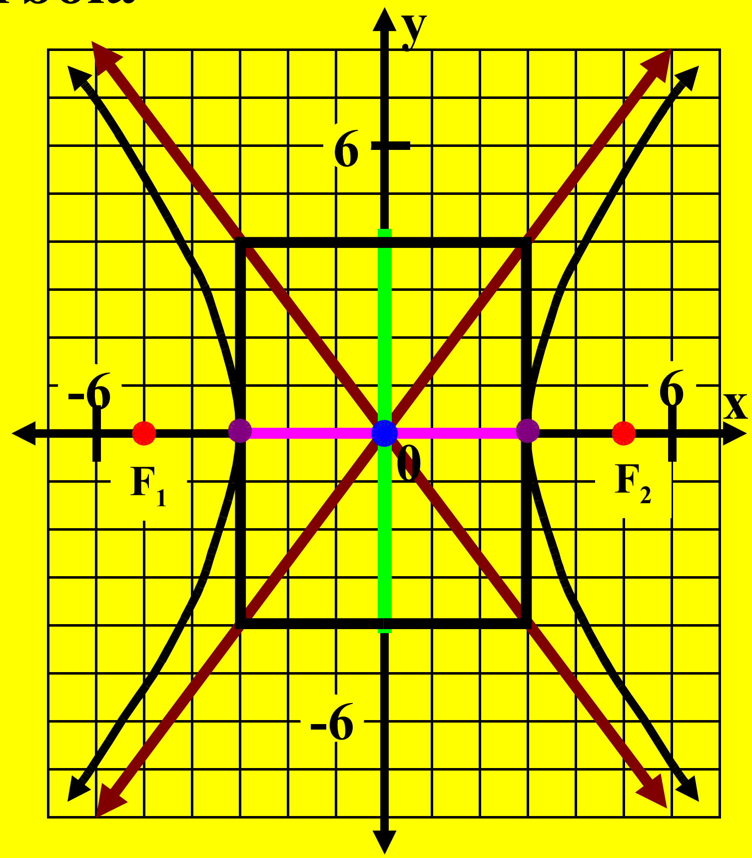

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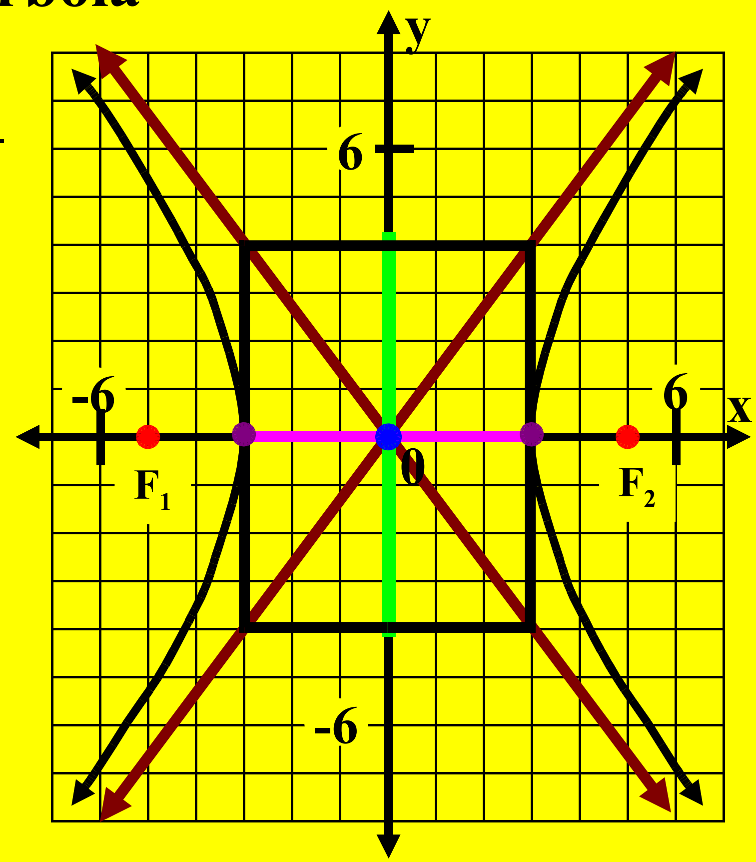
There is one more relationship to consider in this lesson.



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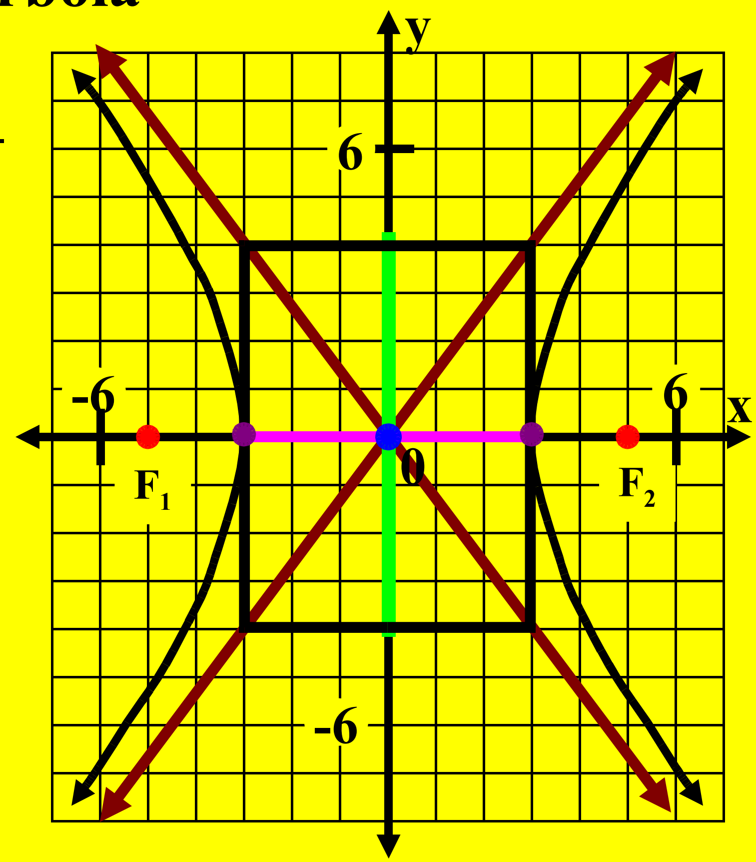

There is one more relationship to consider in this lesson. That is the relationship between the distances a, b, and c.

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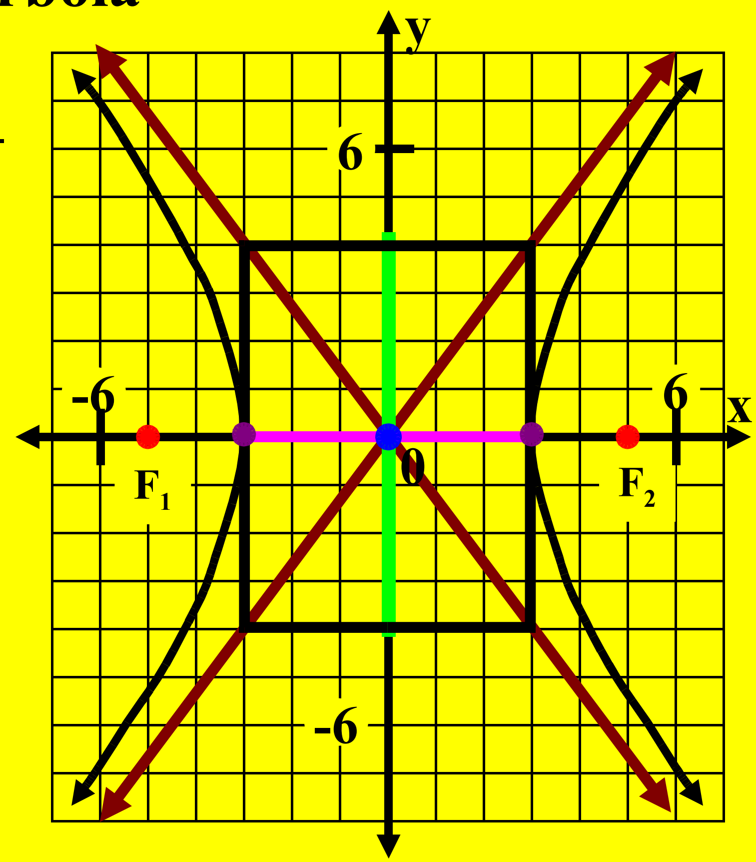

There is one more relationship to consider in this lesson. That is the relationship between the distances a, b, and c. The transverse axis is 2a units long.

Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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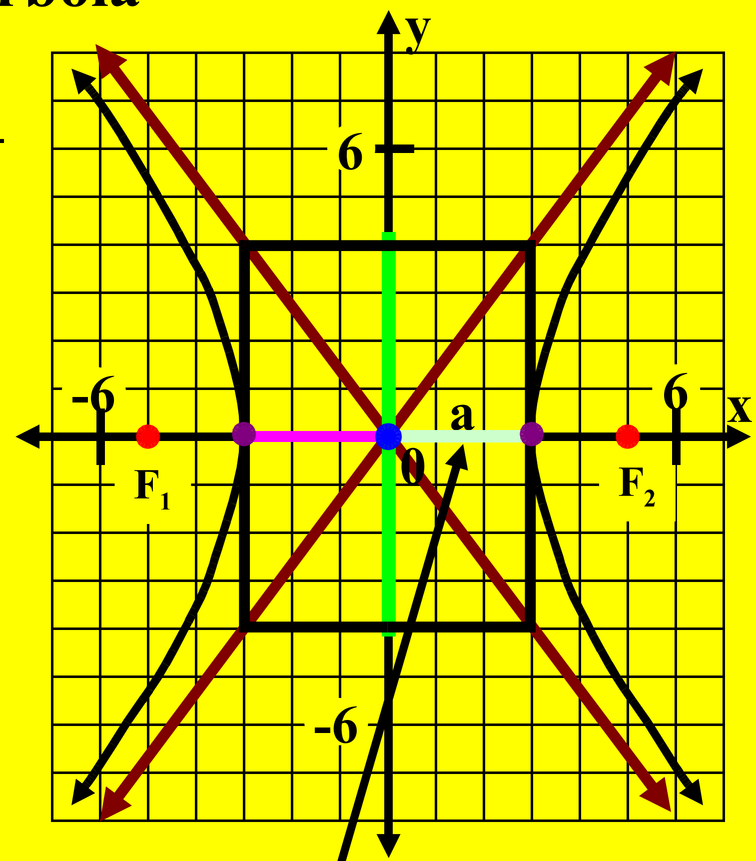

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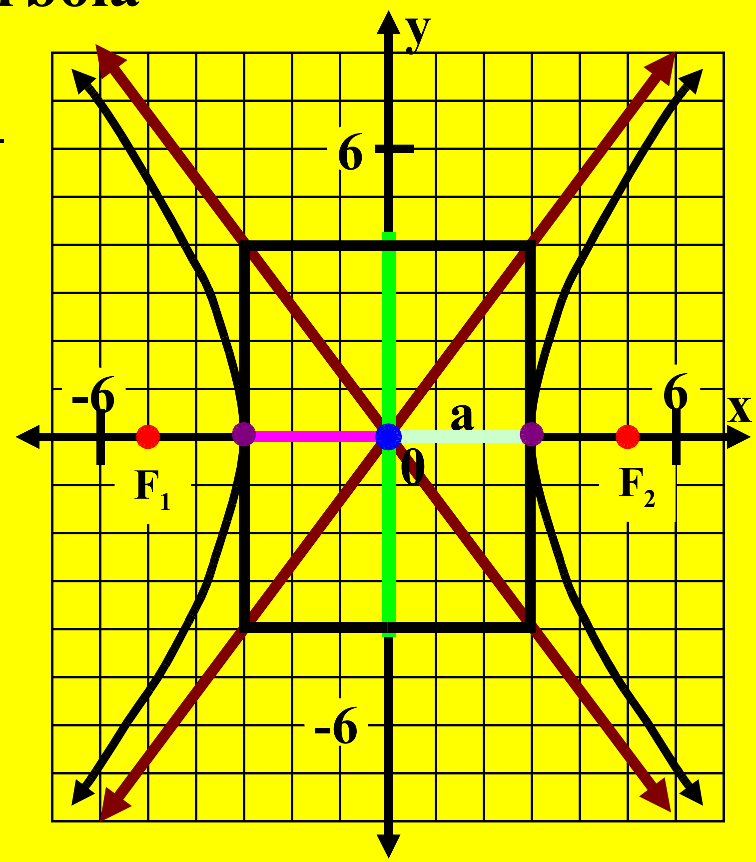

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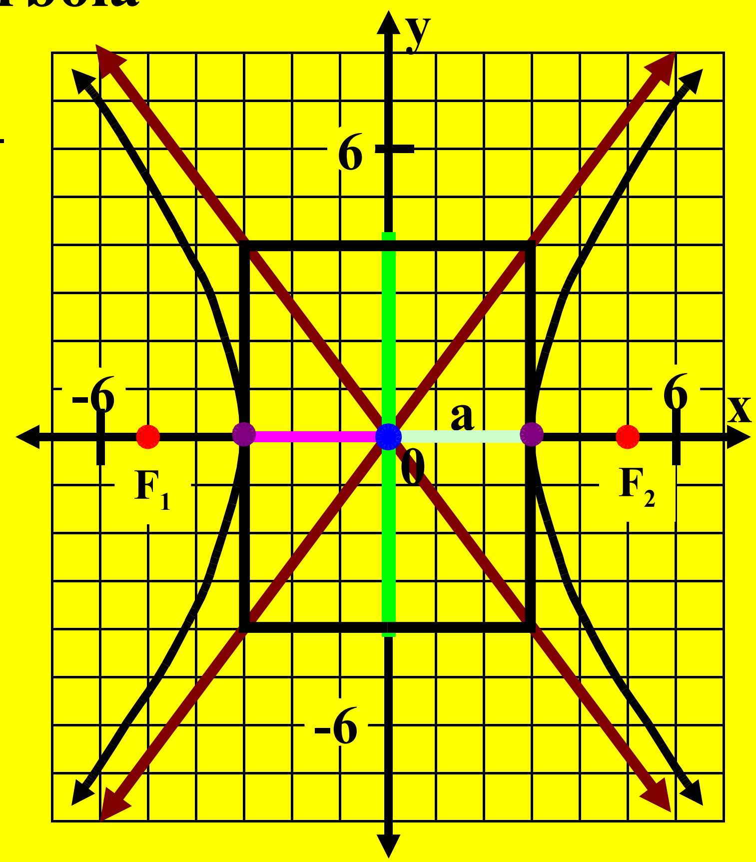

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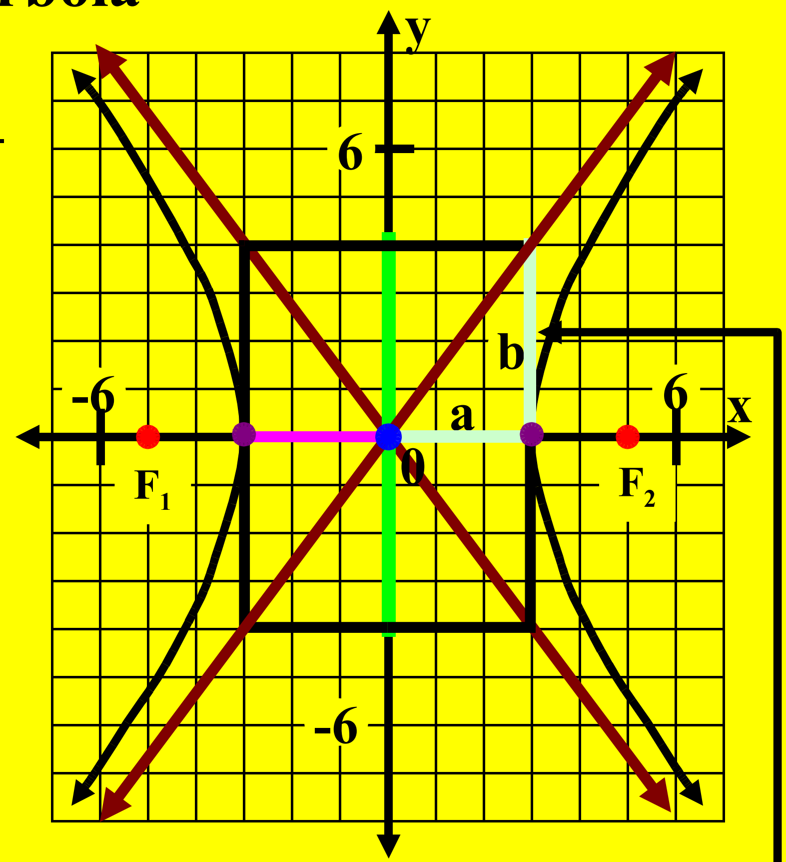

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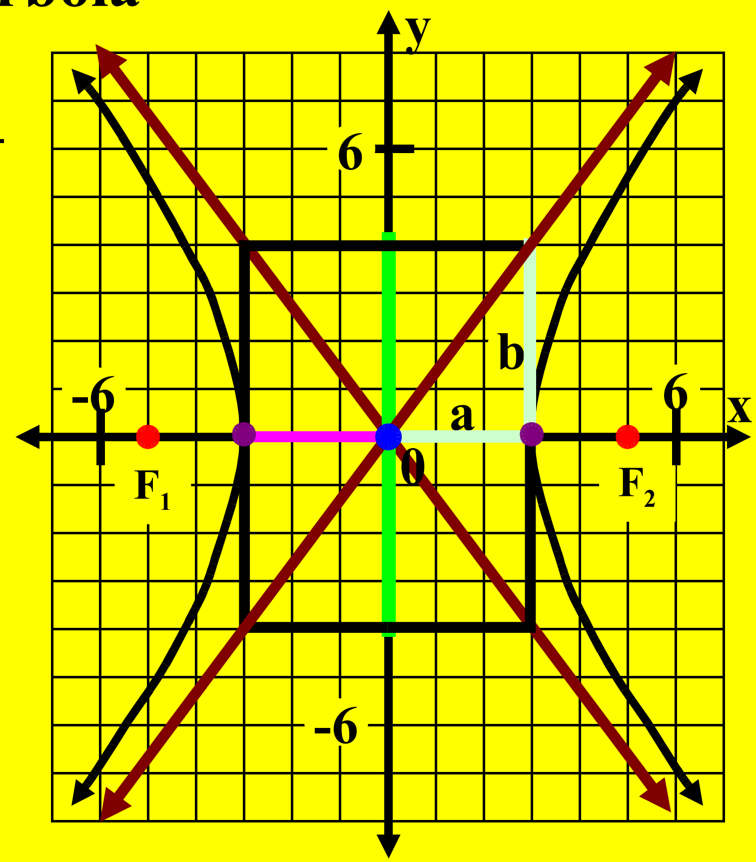

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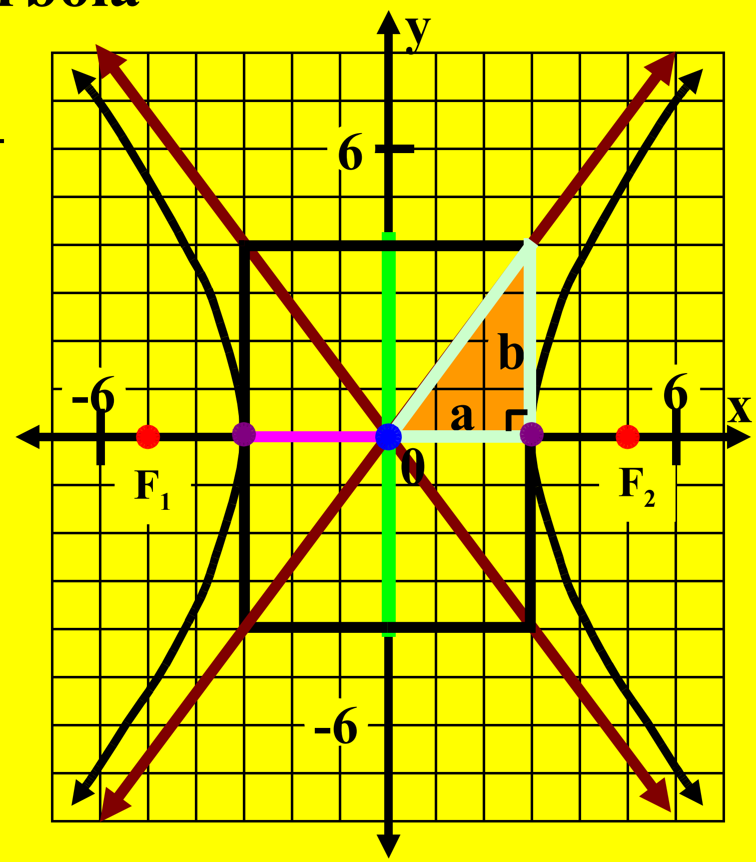

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Equations of a Hyperbola

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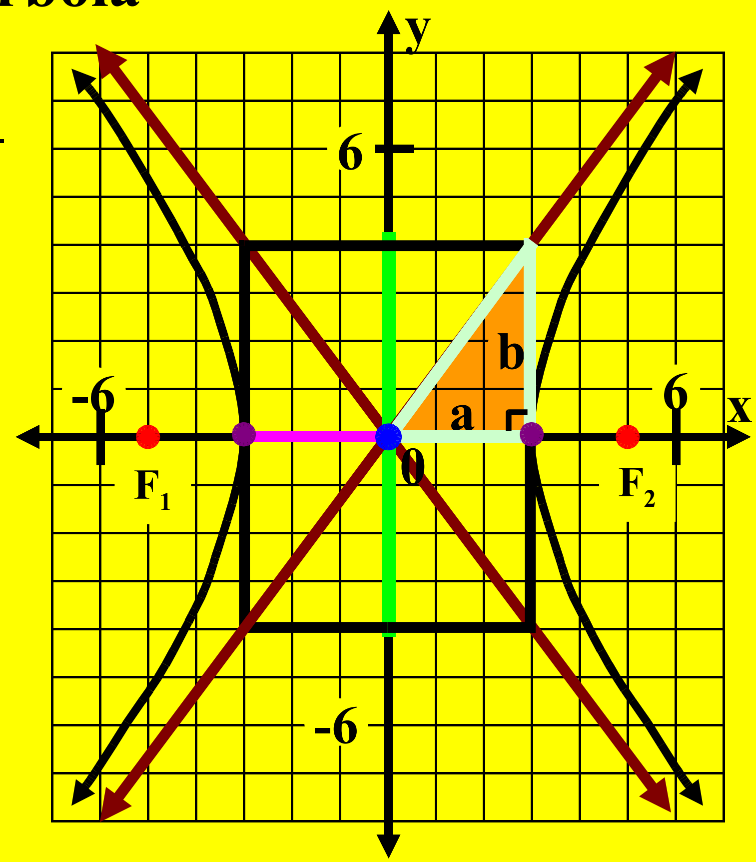

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Equations of a Hyperbola

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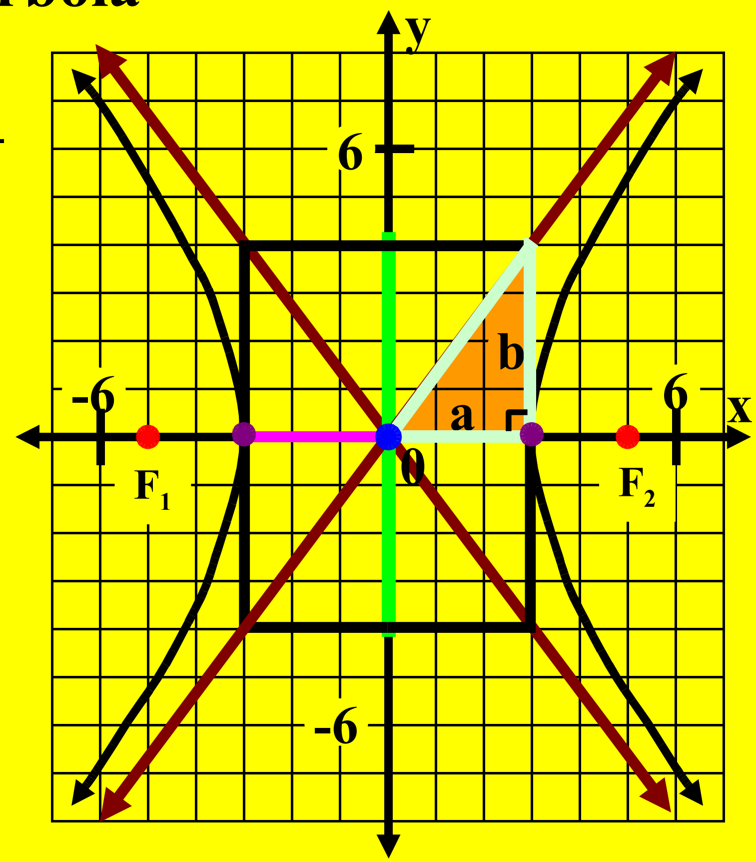
Standard Form Equation



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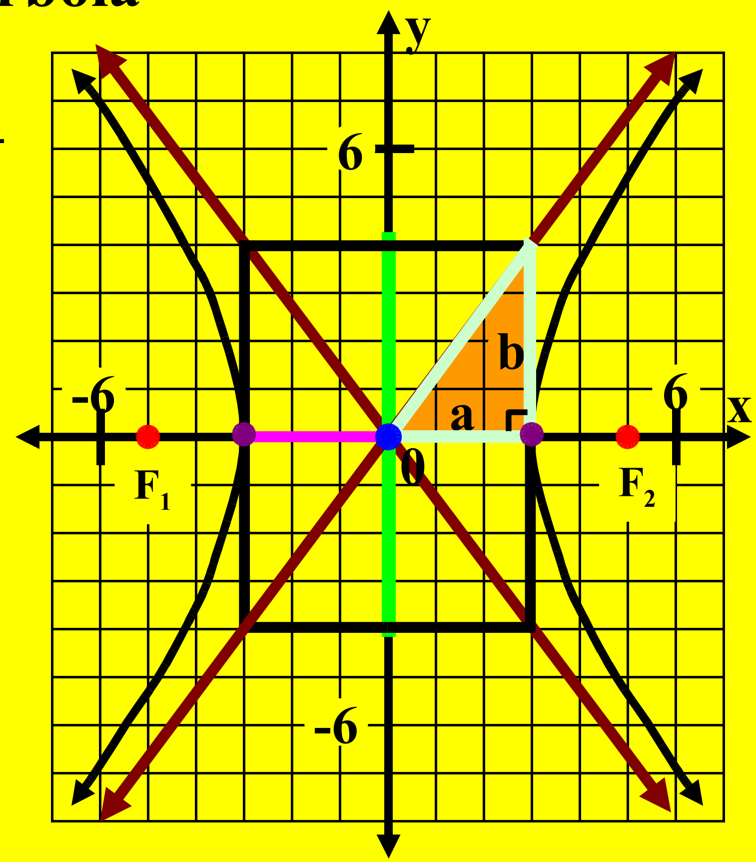

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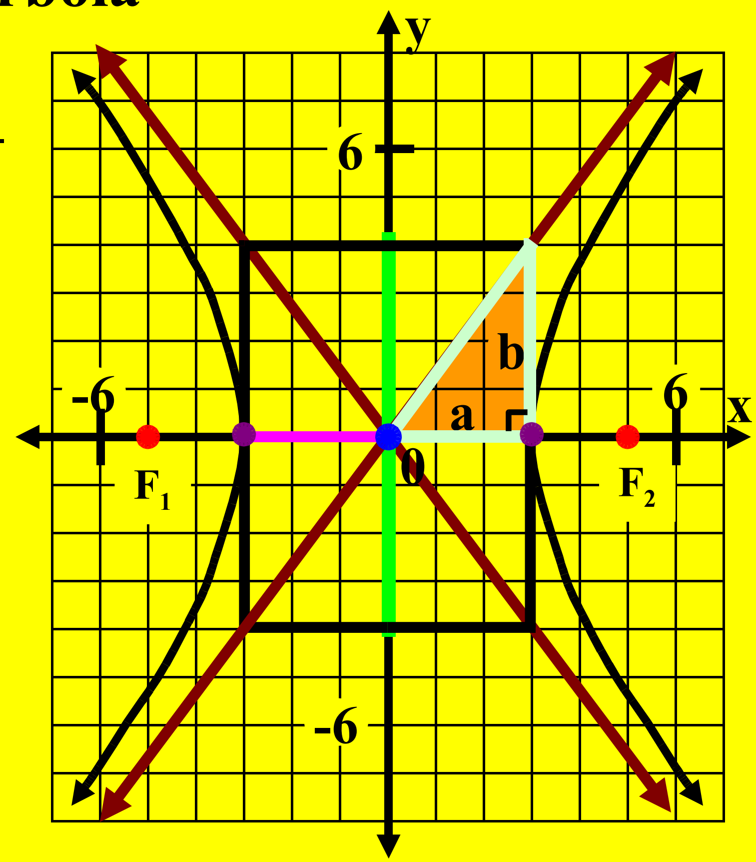

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Equations of a Hyperbola

If P(x, y) represents __any point on the hyperbola__, then

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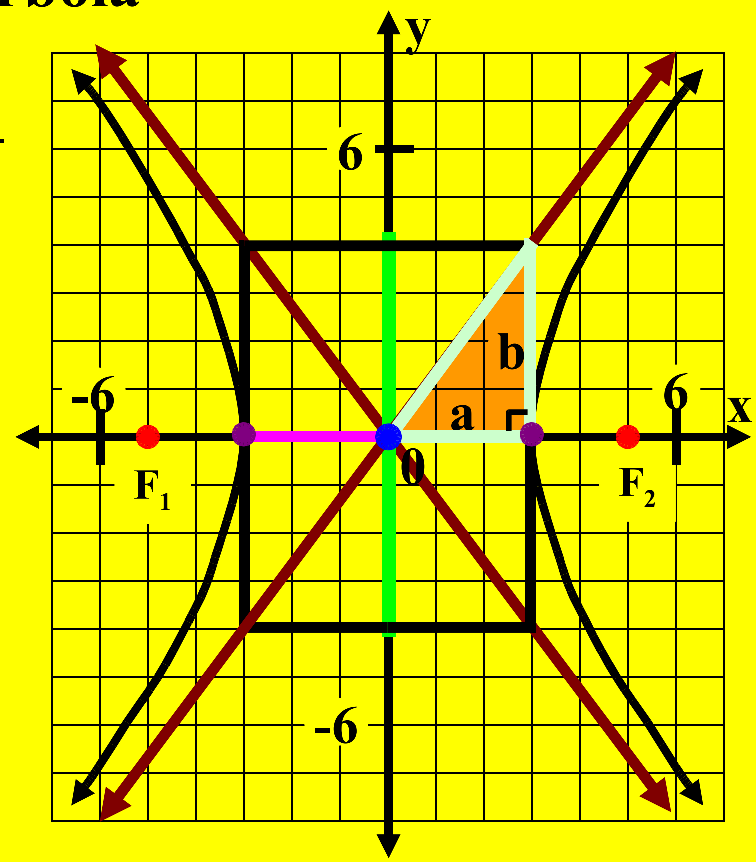
Standard Form Equation



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Equations of a Hyperbola

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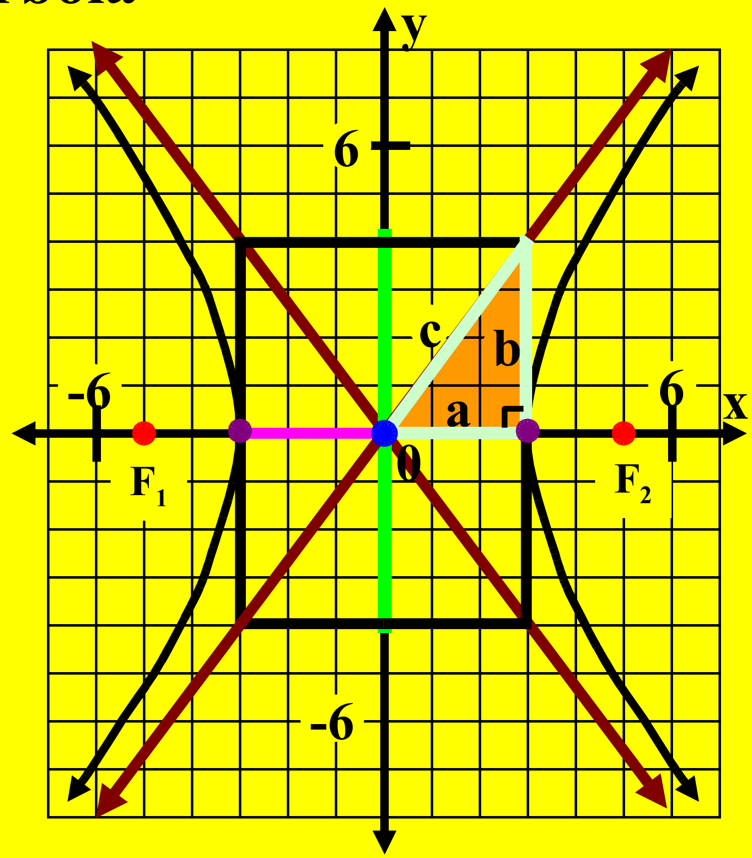
Standard Form Equation



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Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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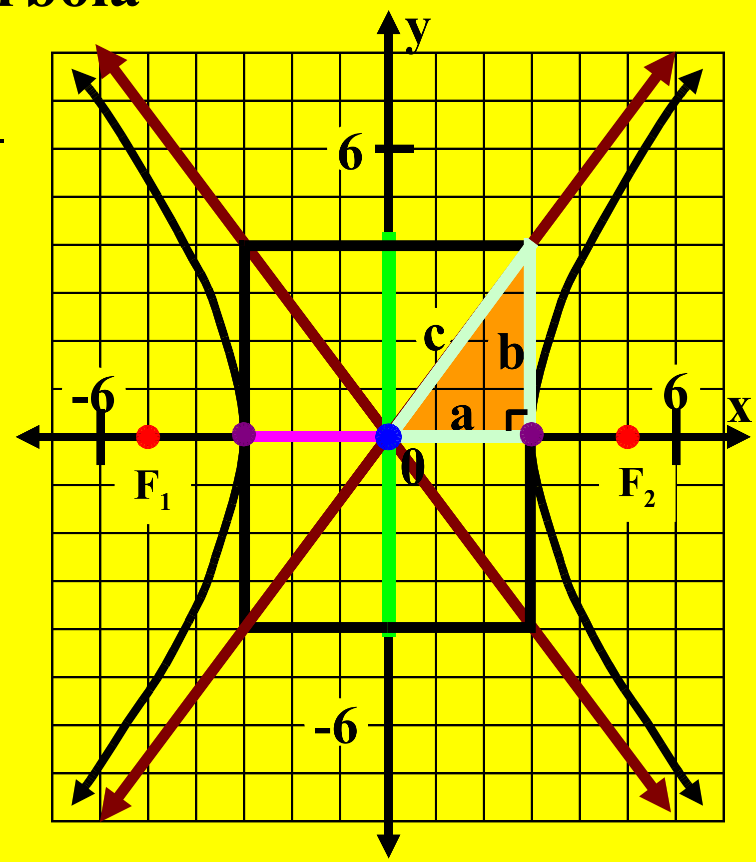
Standard Form Equation



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Equations of a Hyperbola

If P(x, y) represents <u>any point on the hyperbola</u>, then

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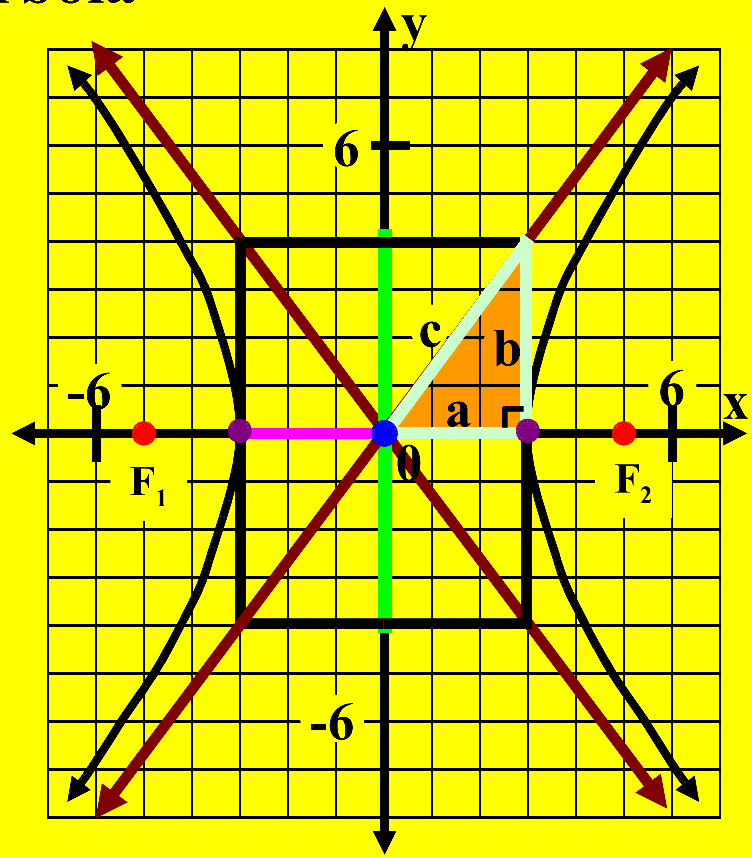
Standard Form Equation



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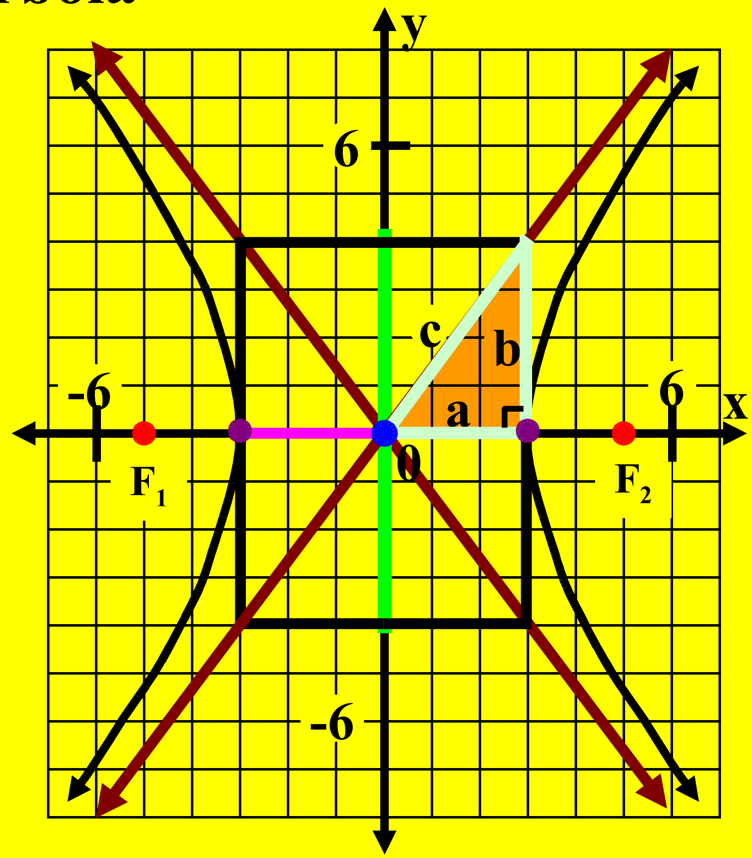


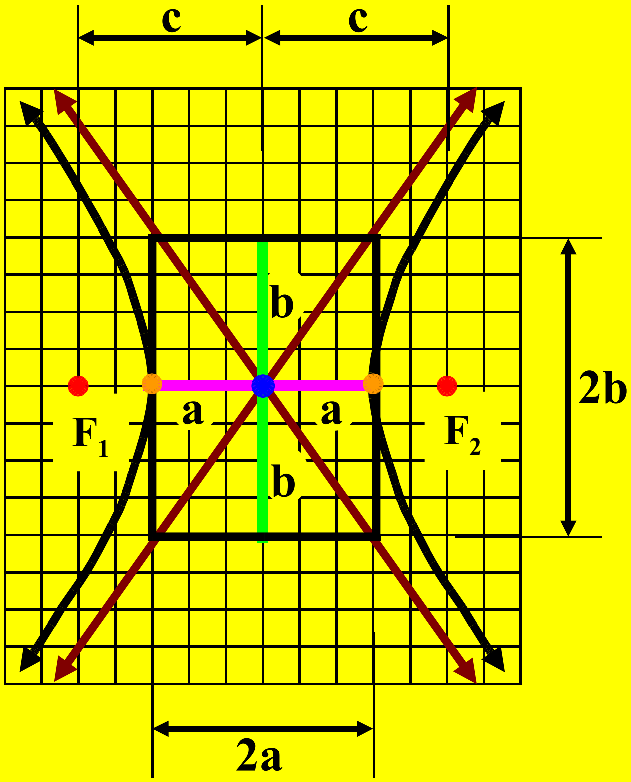
There is one more relationship to consider in this lesson. That is the relationship between the distances a, b, and c.

$$c^2 = a^2 + b^2$$

Equations of a Hyperbola

Equations of a Hyperbola

Type 1
Transverse Axis Horizontal



Equations of a Hyperbola

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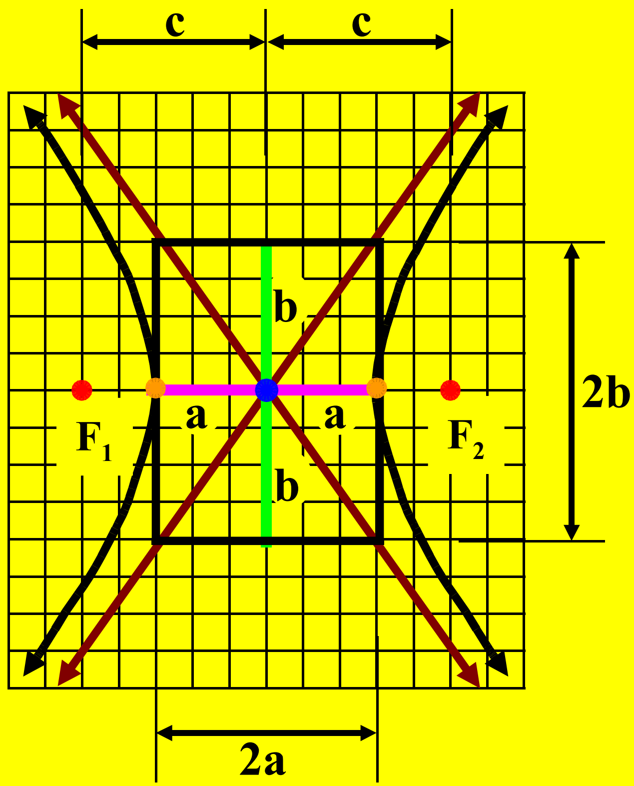
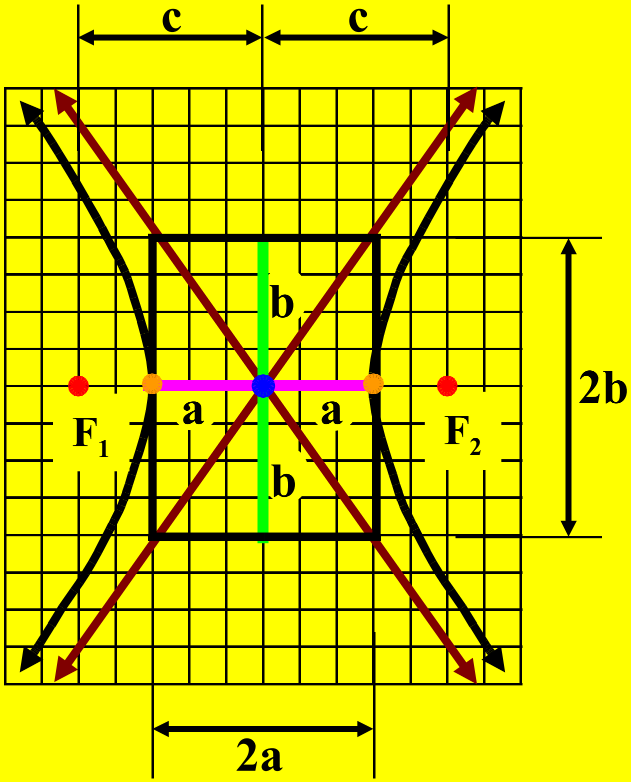


Transverse Axis
2a units long

Equations of a Hyperbola

Type 1
Transverse Axis Horizontal

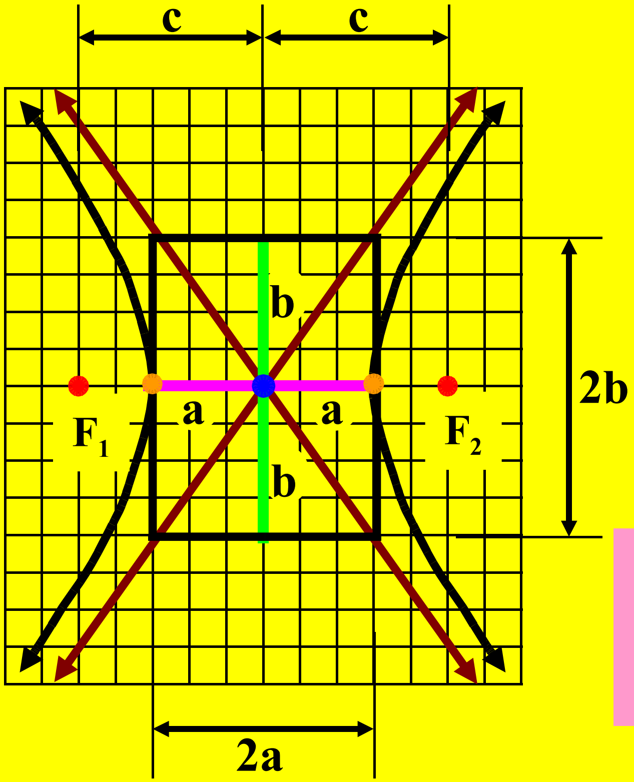


Transverse Axis
2a units long

Conjugate Axis
2b units long

Equations of a Hyperbola

Type 1
Transverse Axis Horizontal



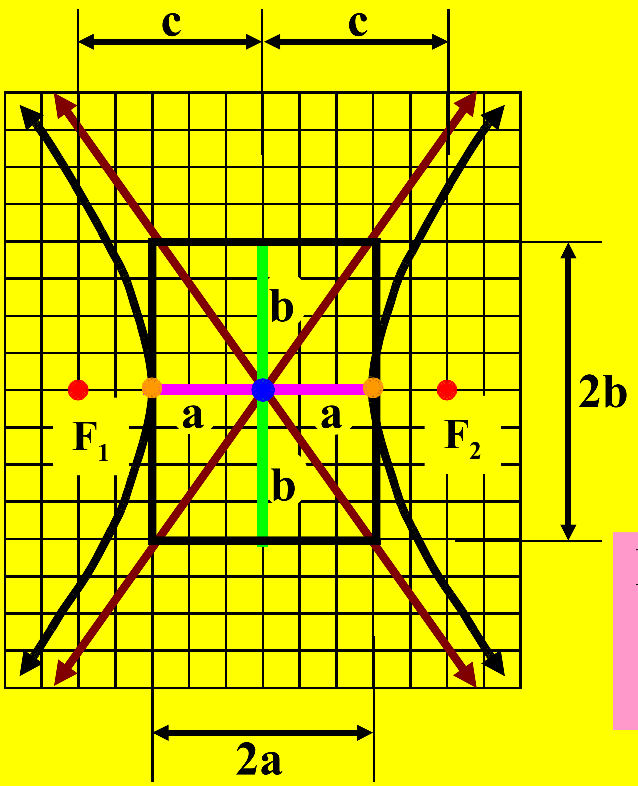
Transverse Axis
2a units long

Conjugate Axis
2b units long

Each focus is c units from the center.
$$c^2 = a^2 + b^2$$

Equations of a Hyperbola

Type 1
Transverse Axis Horizontal



Transverse Axis
2a units long

Conjugate Axis
2b units long

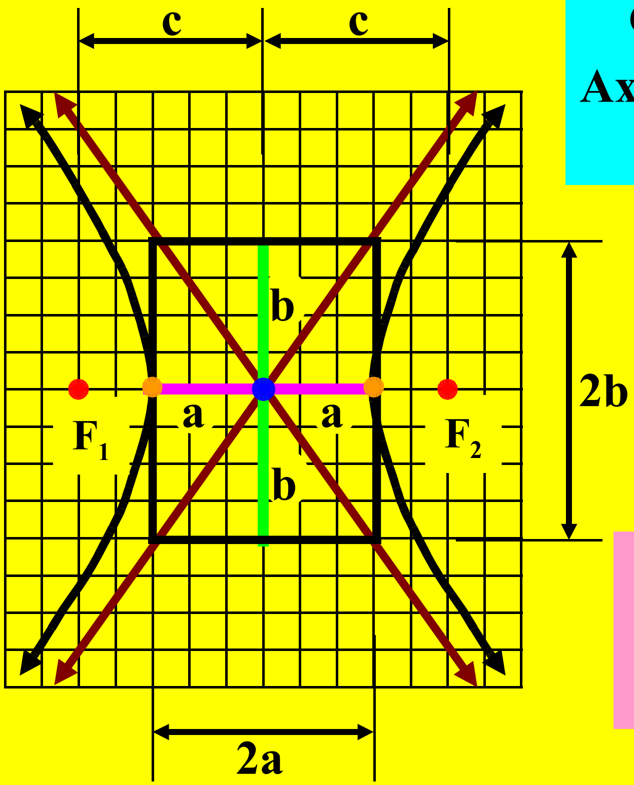
Each focus is c units from the center.
$c^2 = a^2 + b^2$

Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

Equations of a Hyperbola

Type 1
Transverse Axis Horizontal



General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

Transverse Axis
2a units long

Conjugate Axis
2b units long

Each focus is c units from the center.

$$c^2 = a^2 + b^2$$

Standard Form Equation

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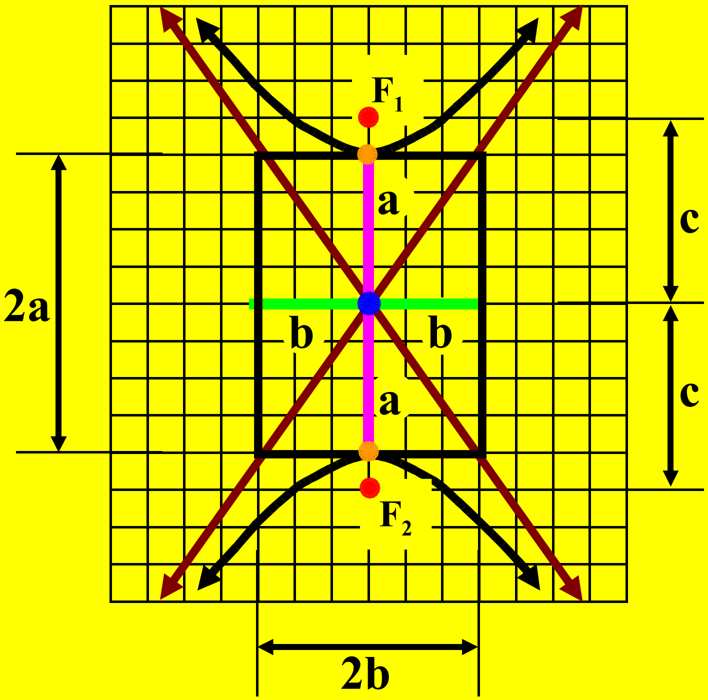
Equations of a Hyperbola

Equations of a Hyperbola

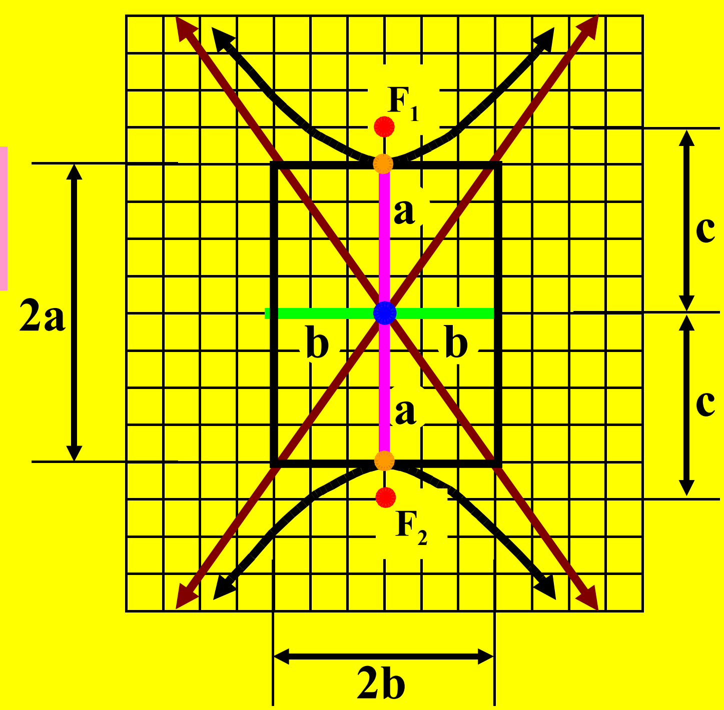
Type 2
Transverse Axis Vertical



Equations of a Hyperbola

Type 2
Transverse Axis Vertical

Transverse Axis
2a units long

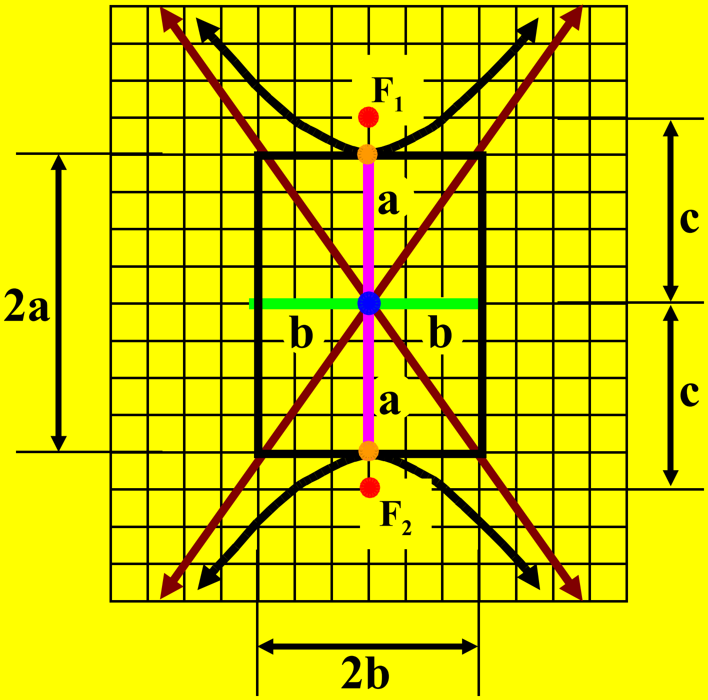


Equations of a Hyperbola

Type 2
Transverse Axis Vertical

Transverse Axis
2a units long

Conjugate Axis
2b units long



Equations of a Hyperbola

Type 2
Transverse Axis Vertical

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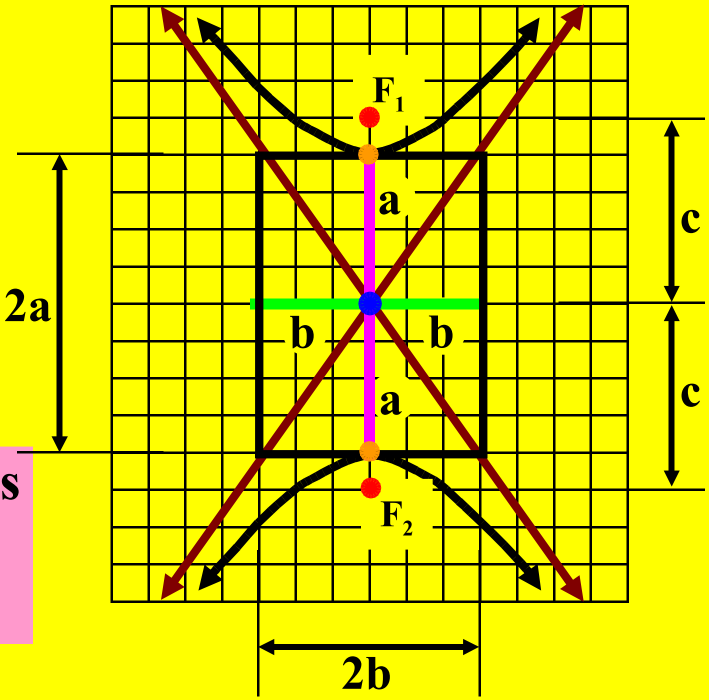

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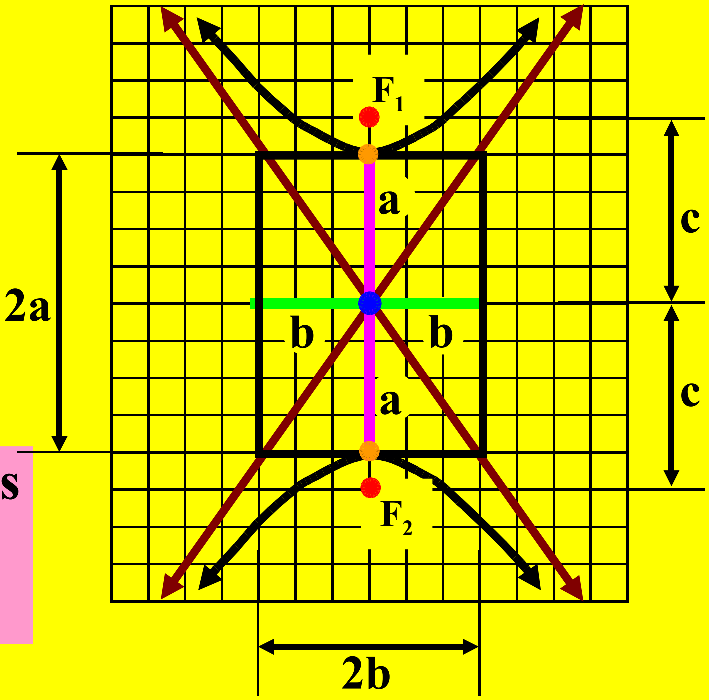

Standard Form Equation

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

Equations of a Hyperbola

Type 2
Transverse Axis Vertical

General Form Equation

$Ax^2 + Cy^2 + Dx + Ey + F = 0$

$AC < 0$

Transverse Axis
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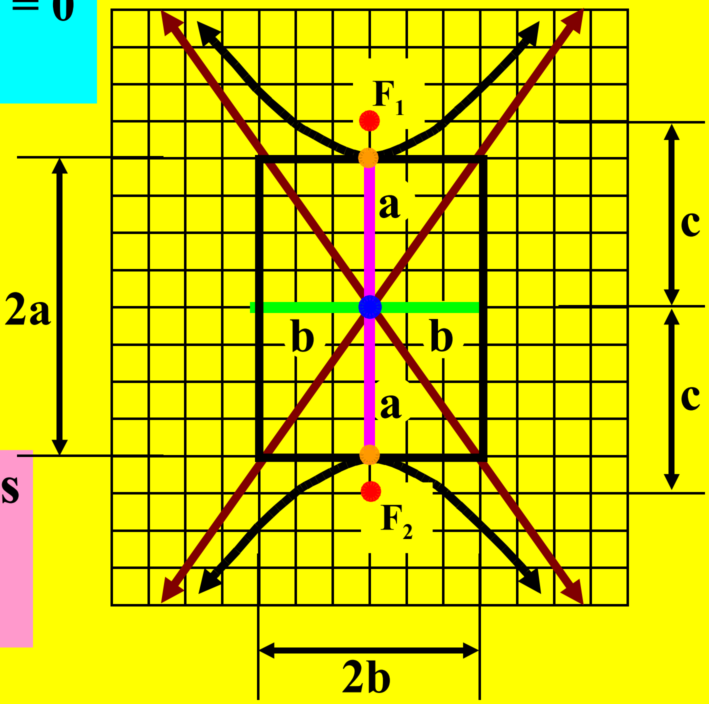

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Equations of a Hyperbola

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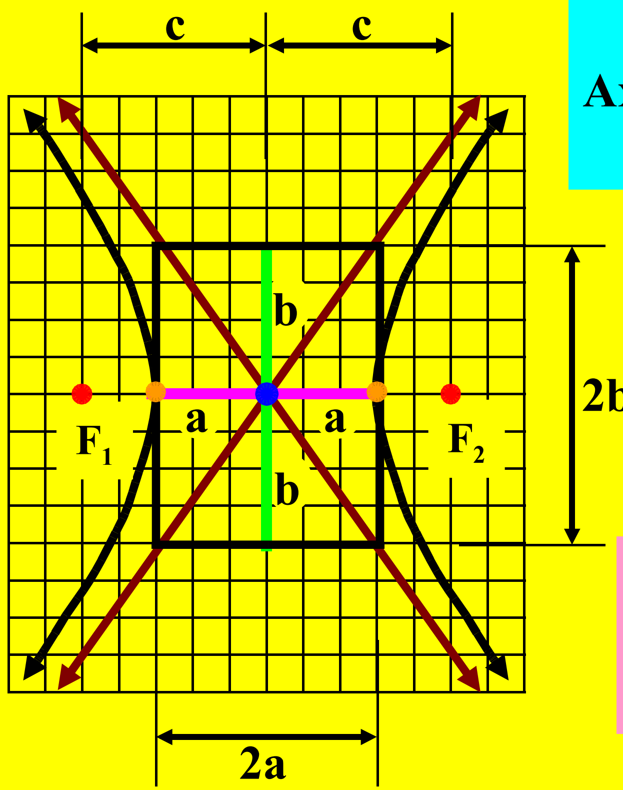

General Form Equation

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Transverse Axis
2a units long

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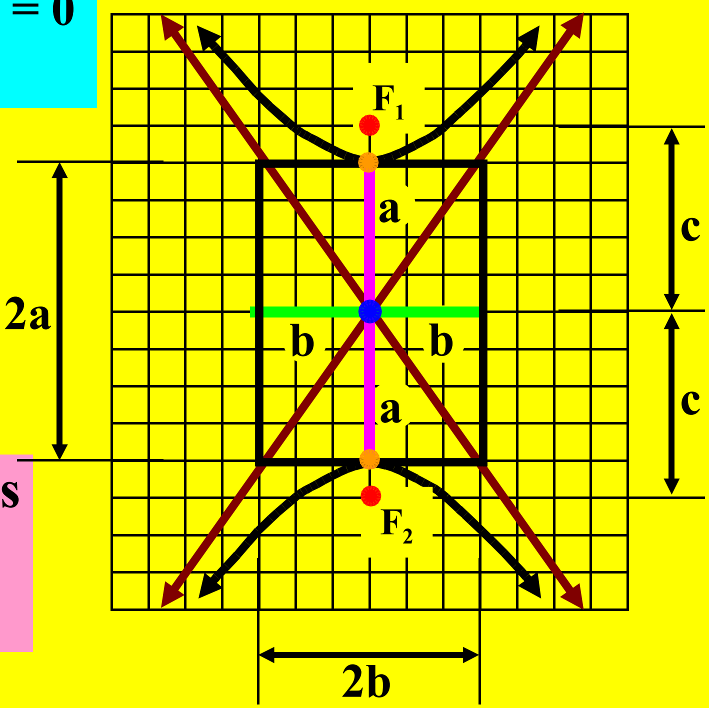

Standard Form Equation

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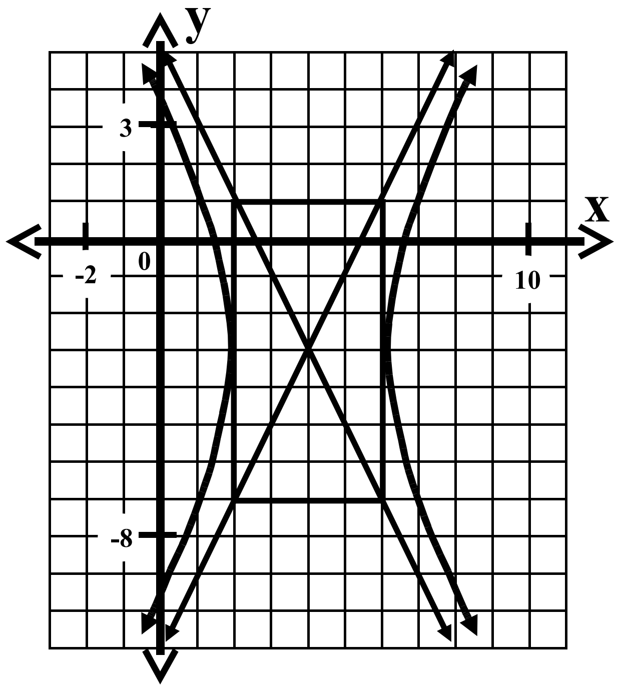
Class Worksheet #3

Write the equation in standard form and the equation in general form for each hyperbola. Then locate and label the foci F_1 and F_2.

1.



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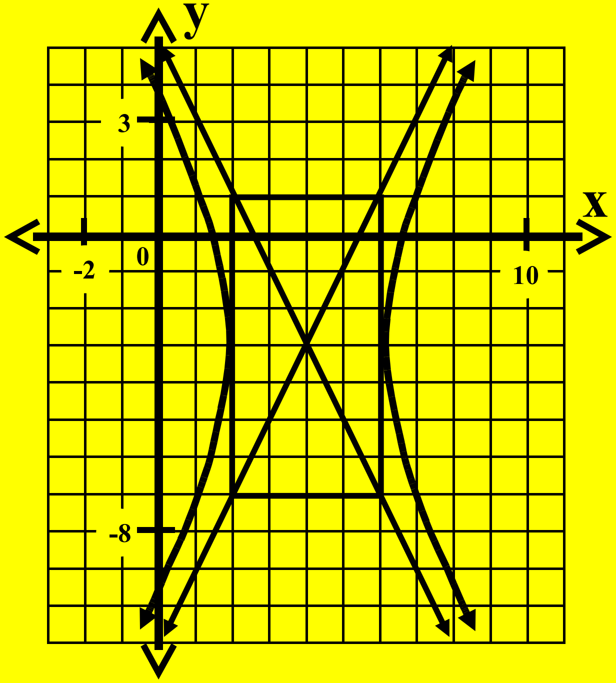

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This a type 1 Hyperbola.

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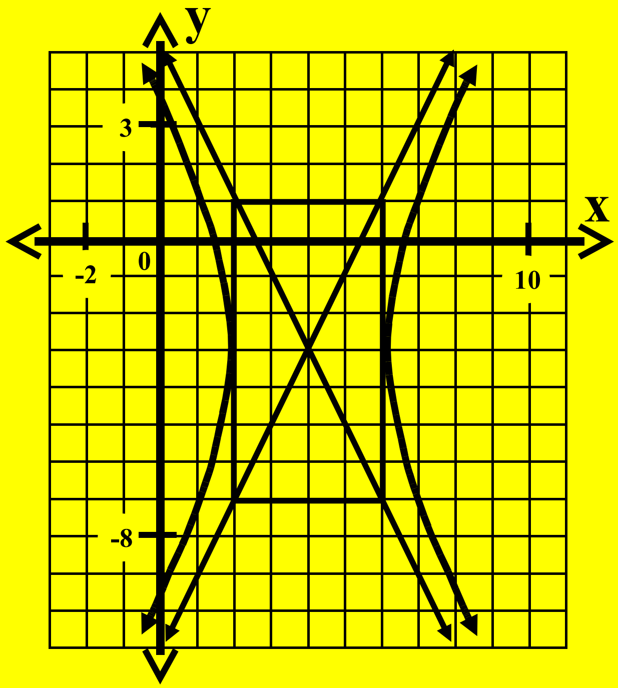

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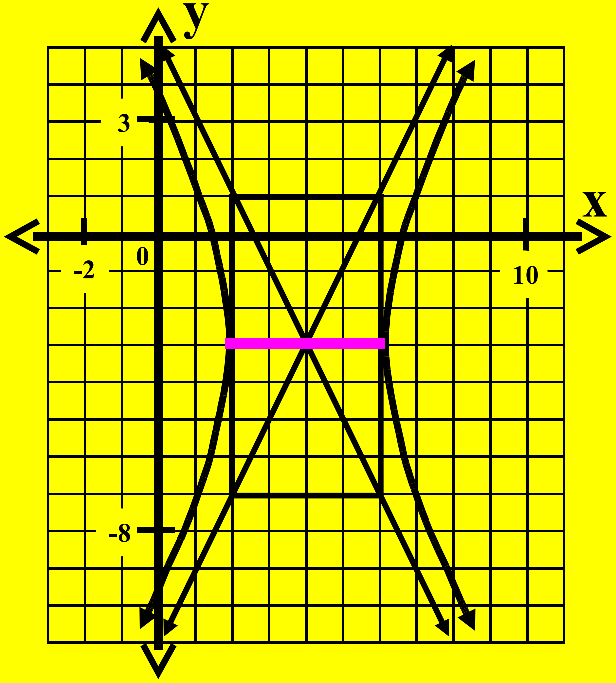

This a type 1 Hyperbola.
(The transverse axis is horizontal.)

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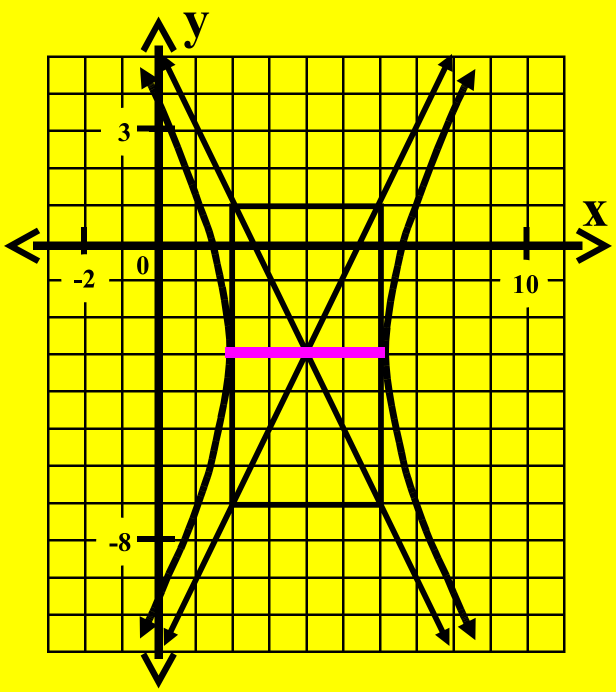

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Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

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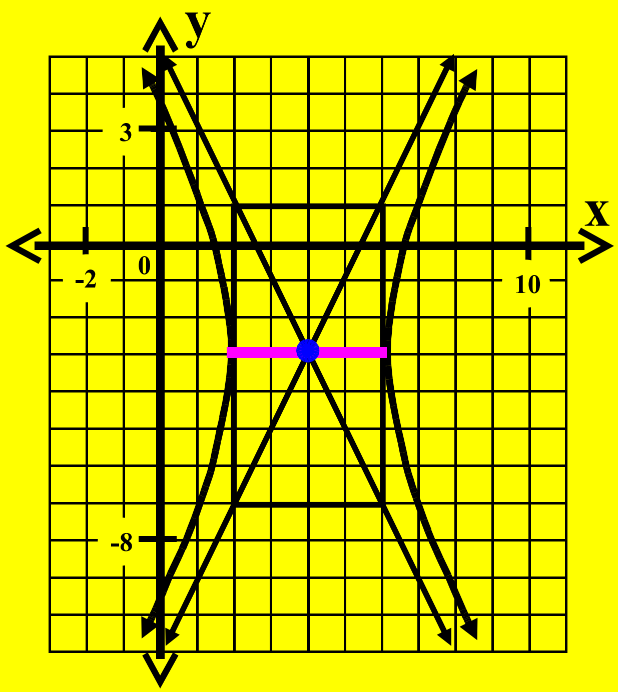

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Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

The center

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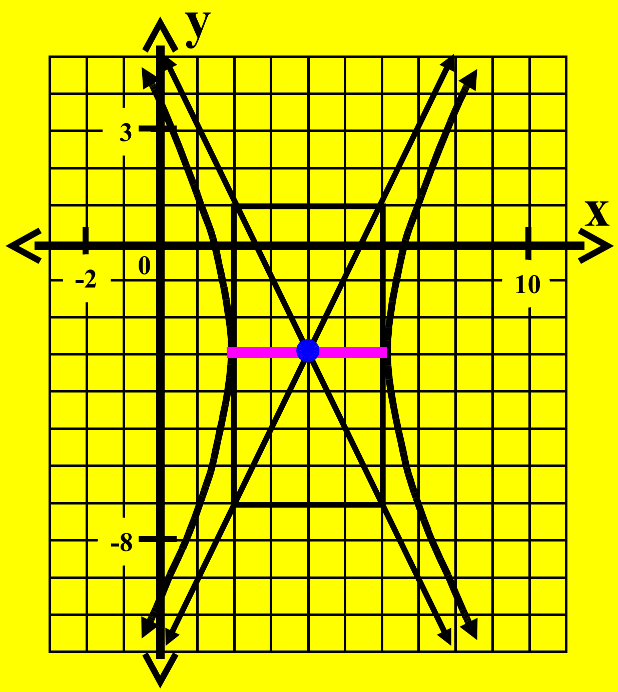

This a type 1 Hyperbola.
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Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

The center is the point (4, -3).

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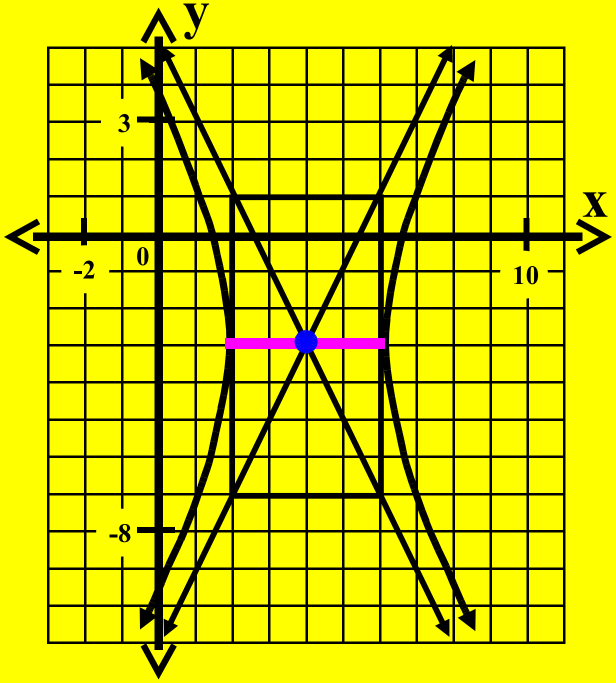

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Standard Form Equation

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h = 4

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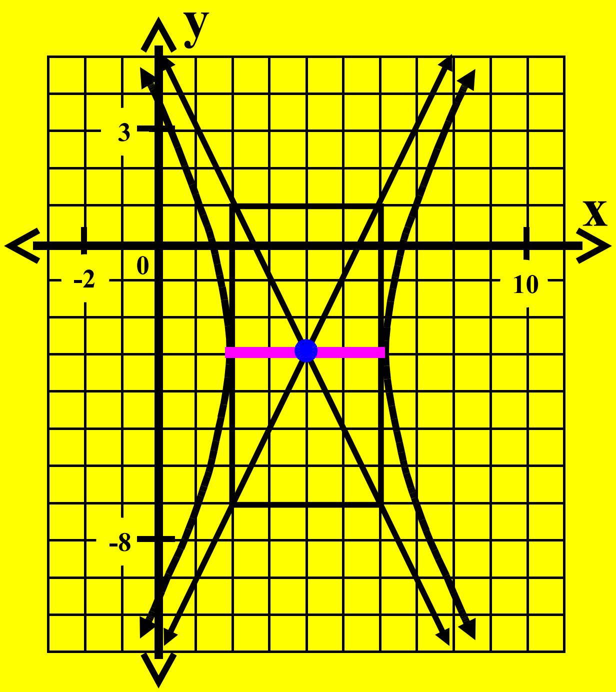

This a type 1 Hyperbola.
(The transverse axis is horizontal.)

Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

The center is the point (4, -3).

h = 4 and

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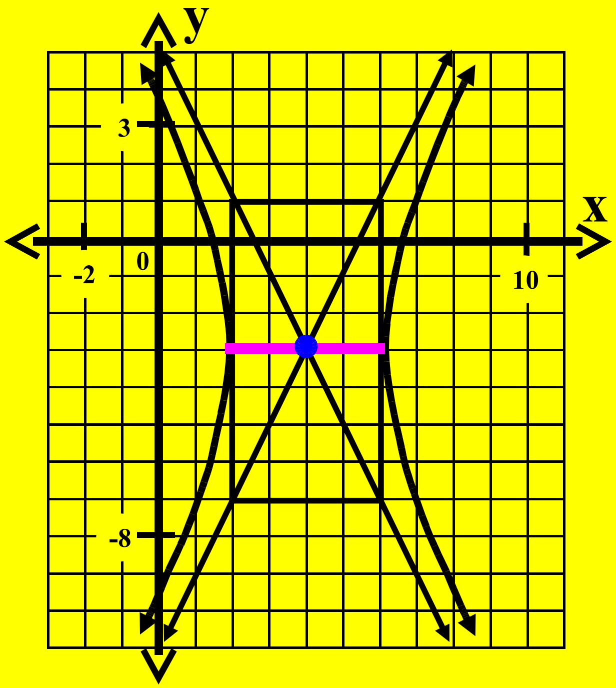

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Standard Form Equation

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The center is the point (4, -3).

h = 4 and k = -3

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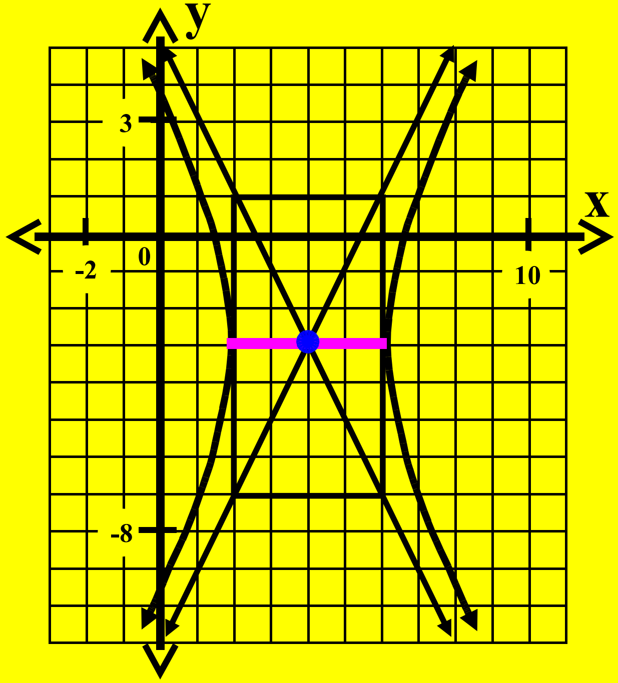

This a type 1 Hyperbola.
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$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

The center is the point (4, -3).

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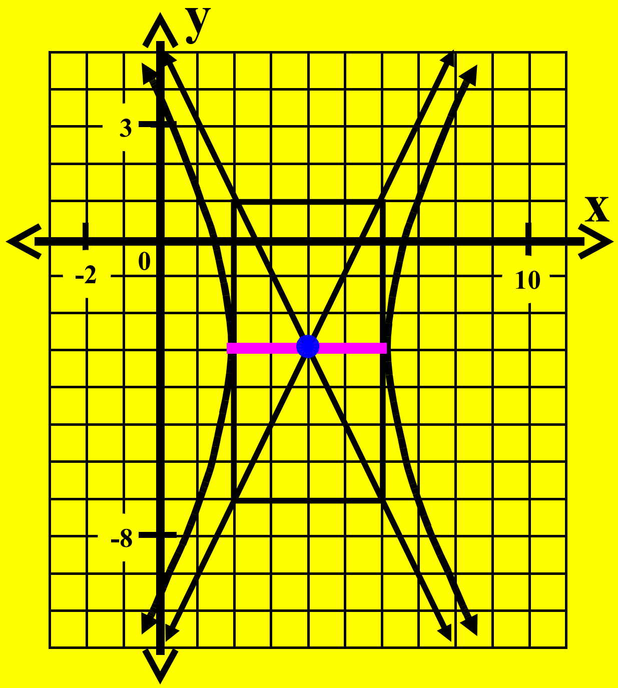

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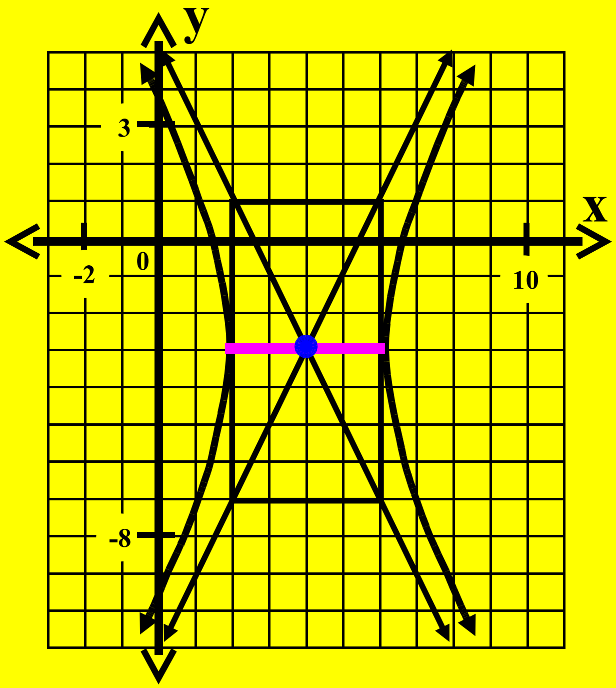

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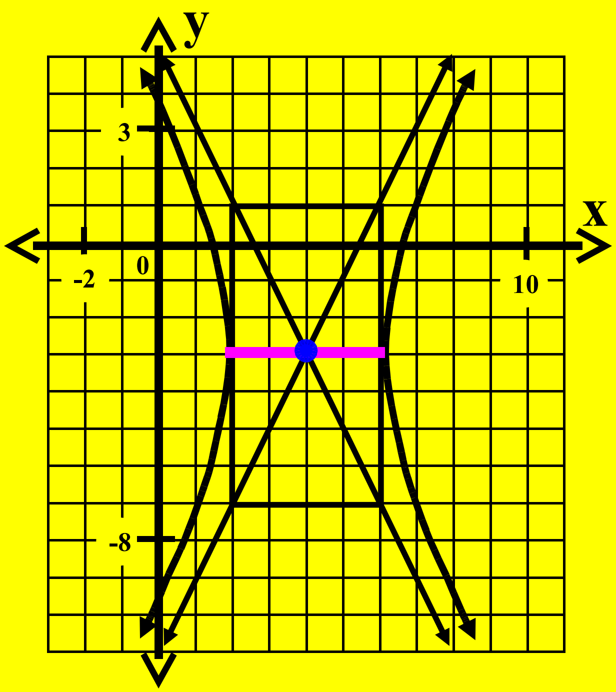

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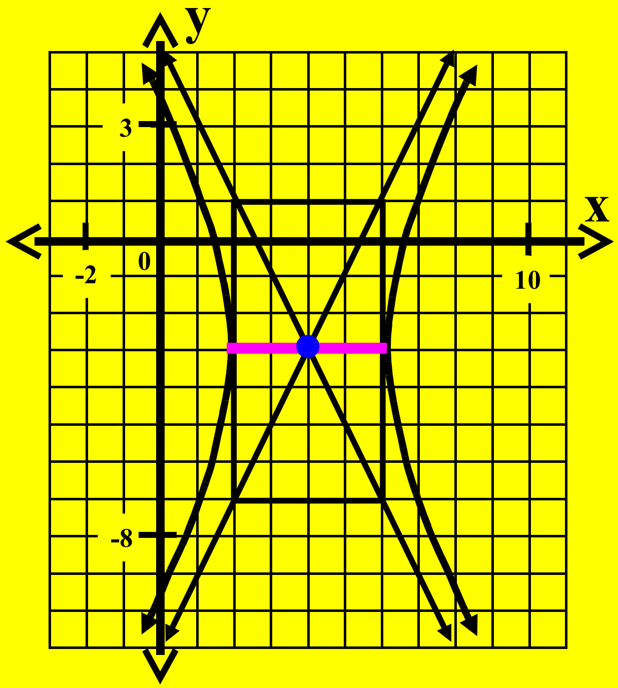

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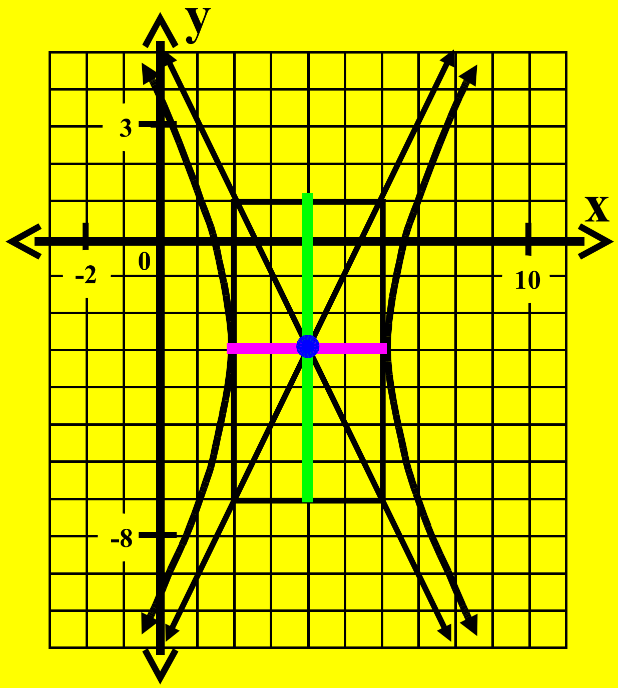

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The conjugate axis

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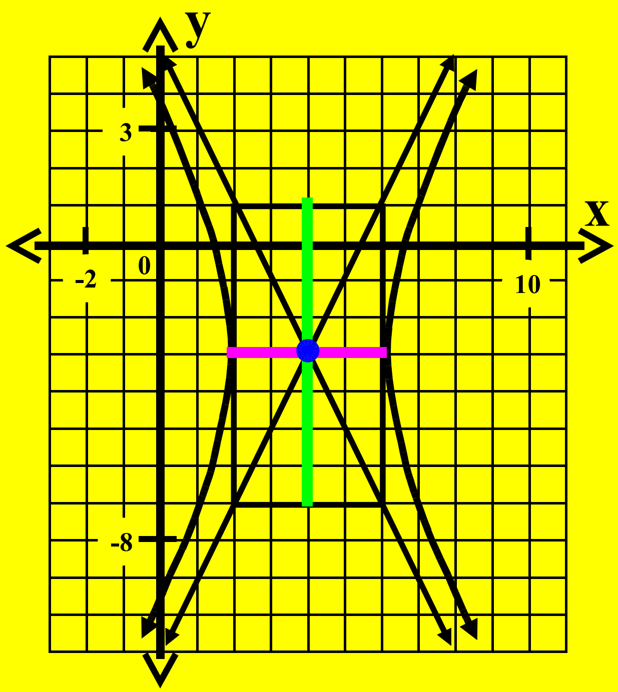

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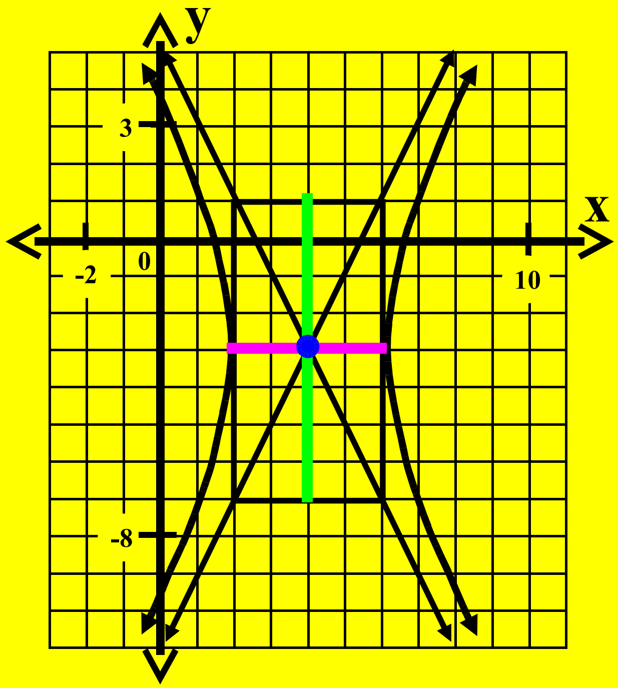

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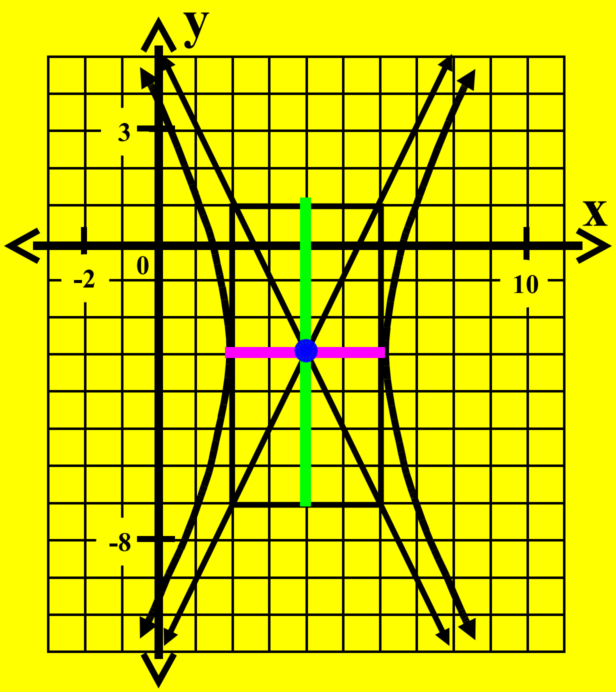

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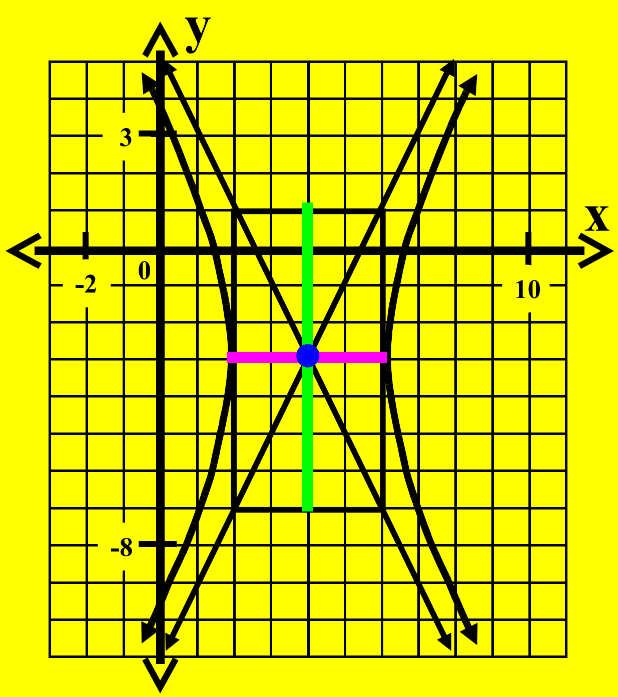

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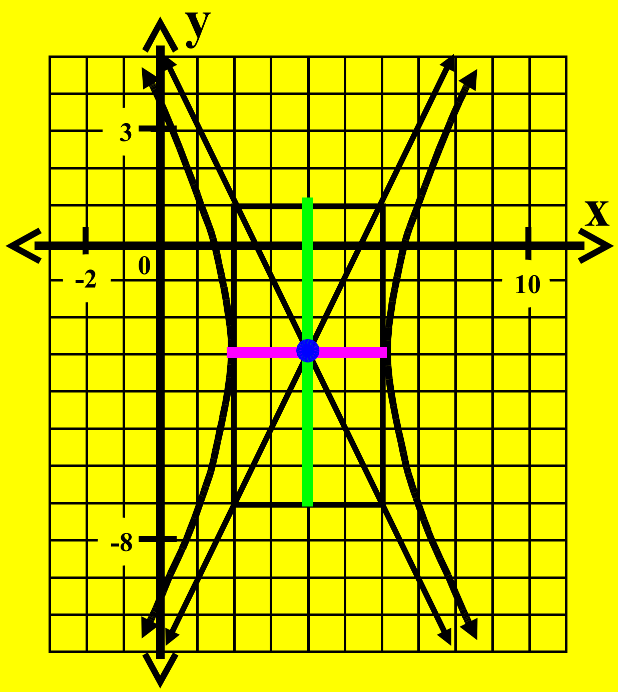

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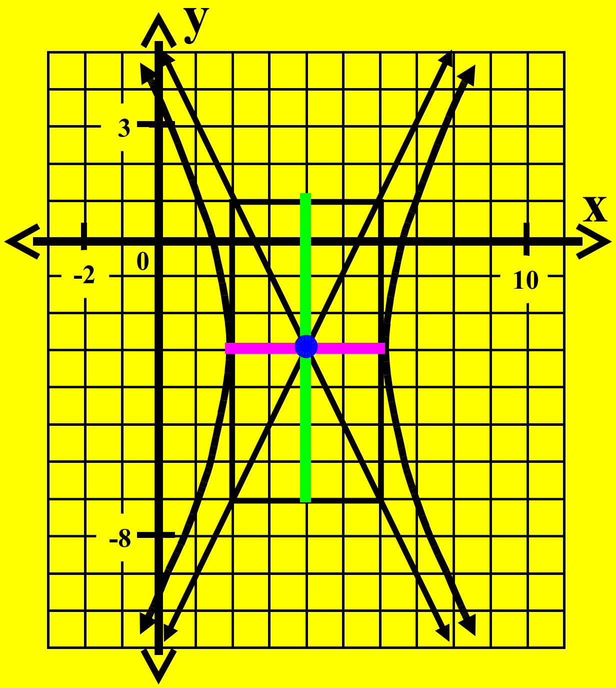

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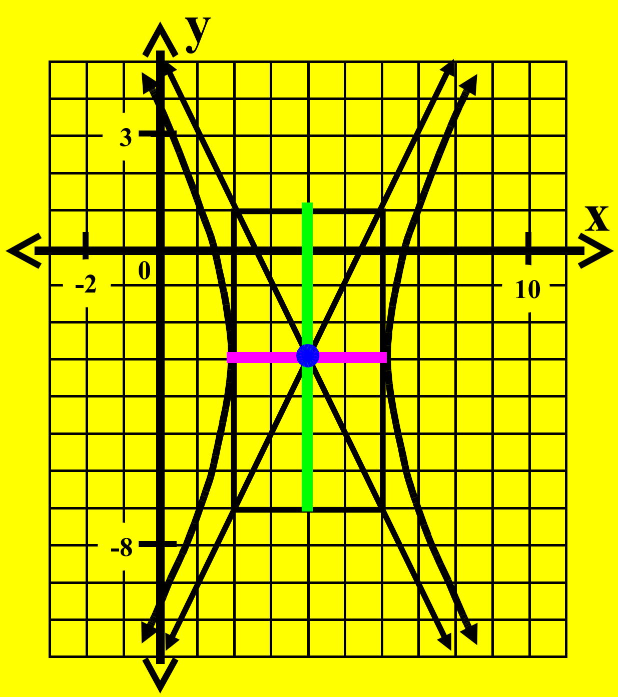

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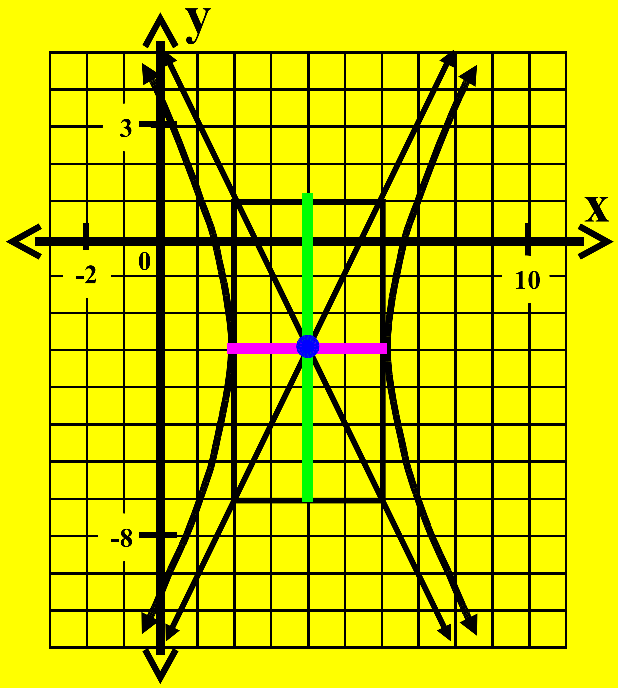

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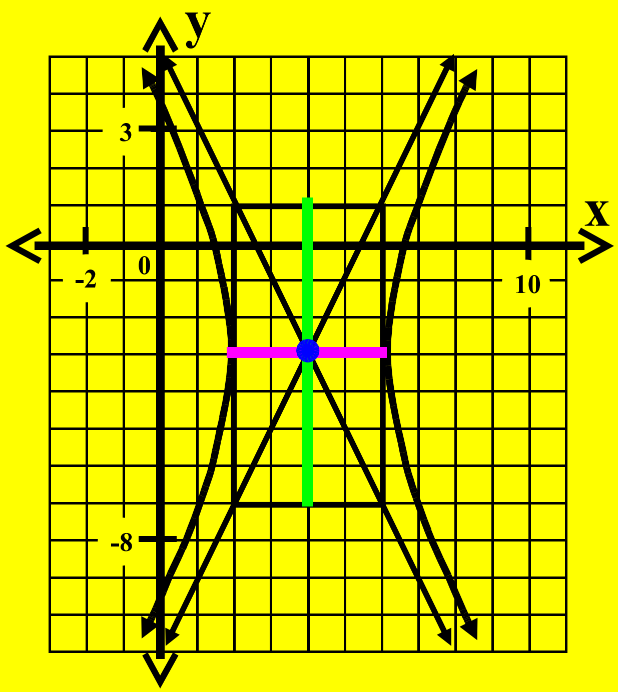

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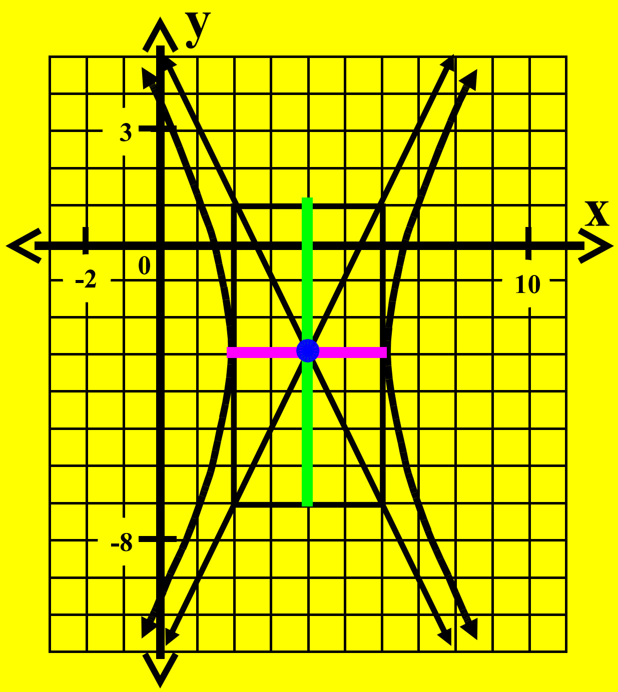

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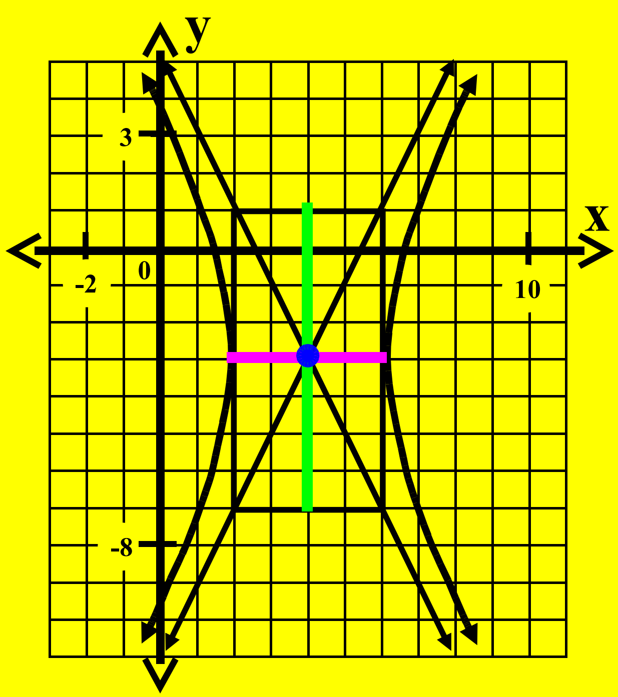

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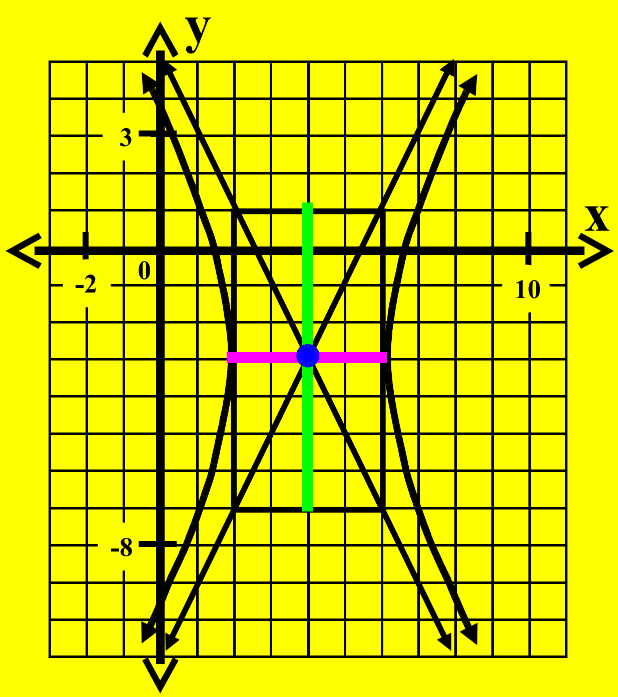

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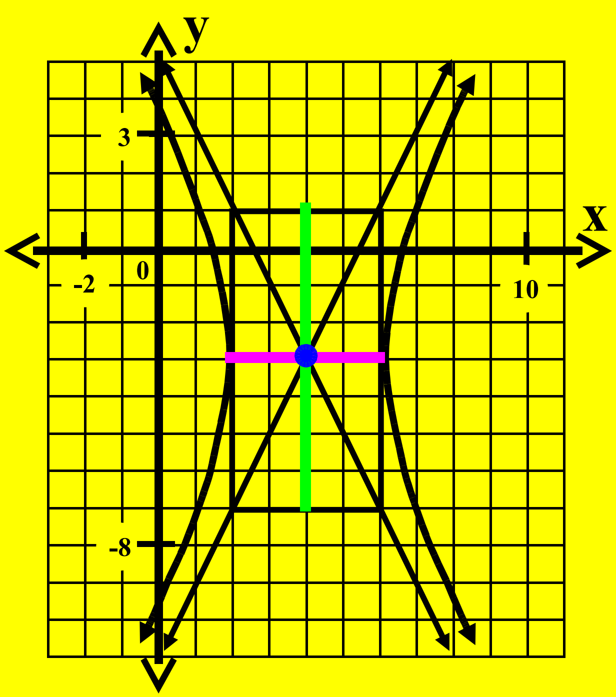

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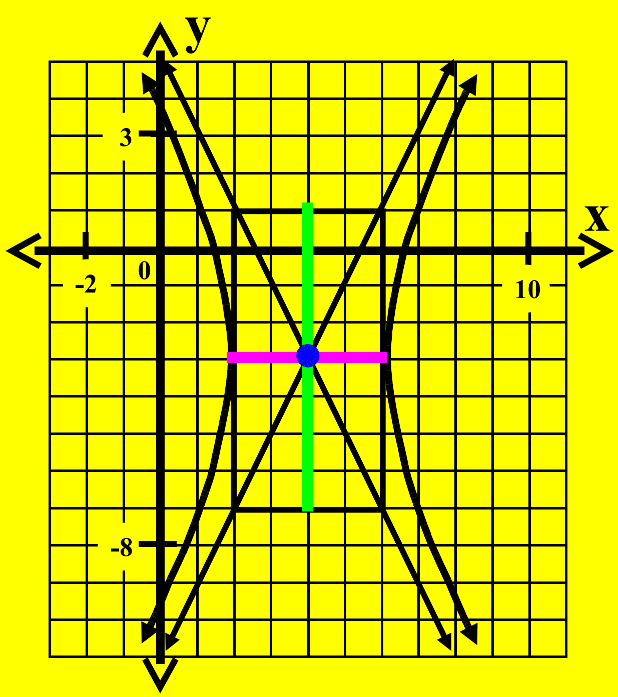

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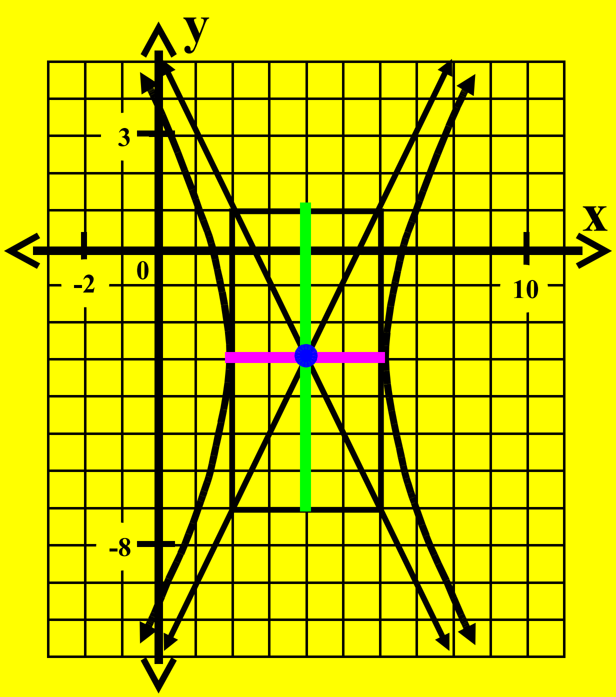

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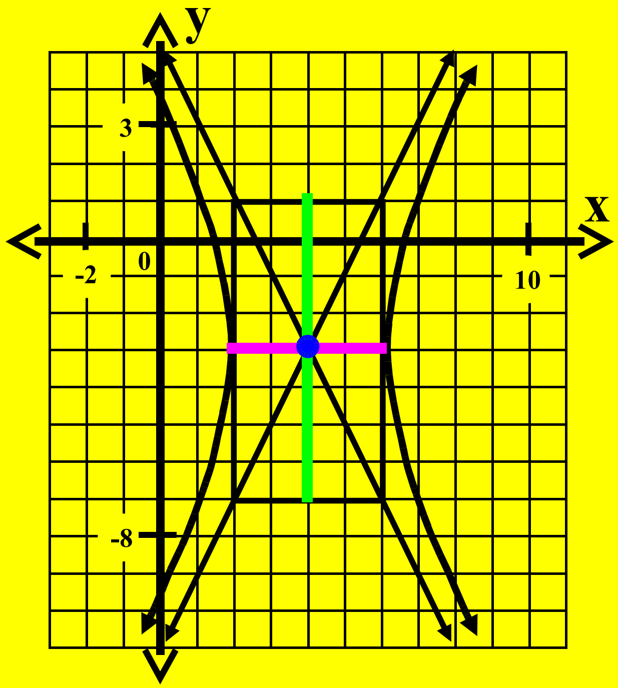

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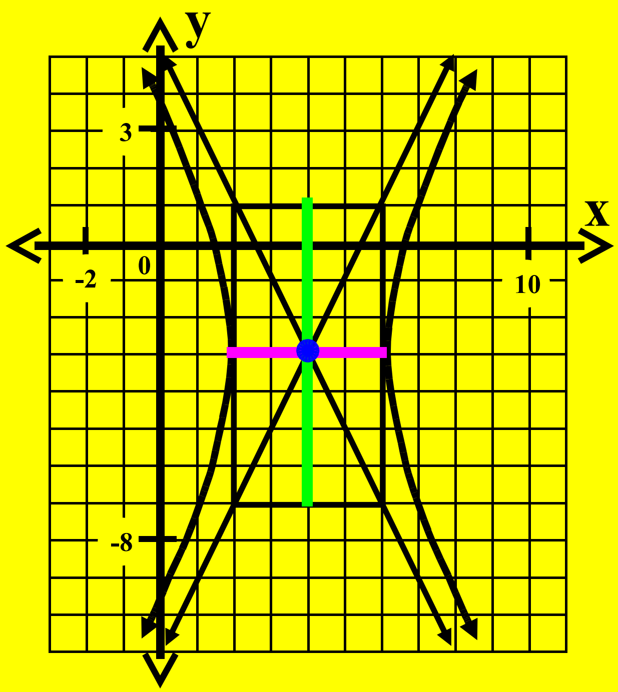

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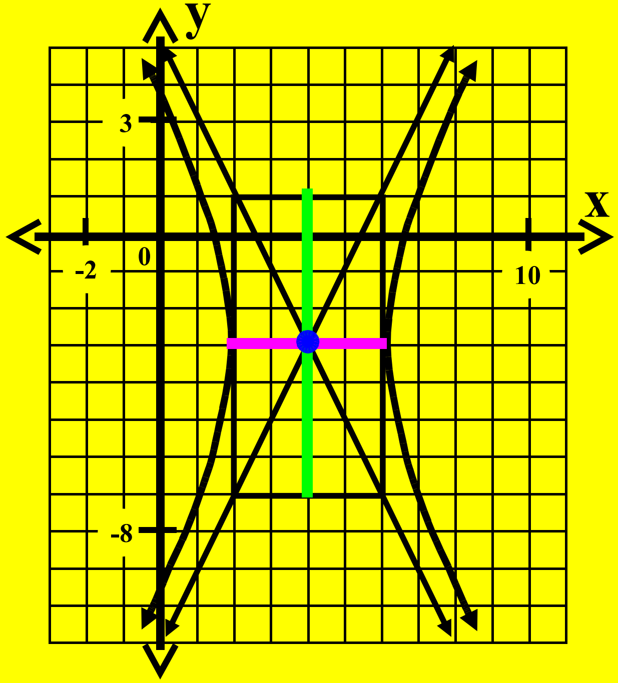

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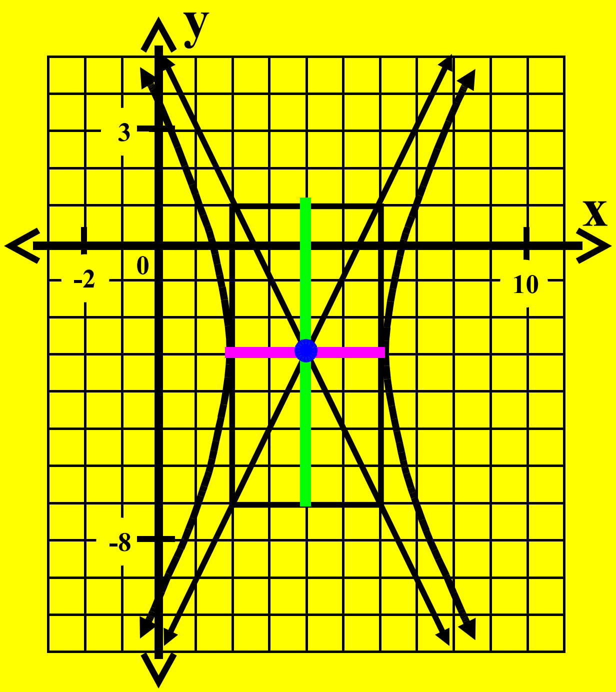

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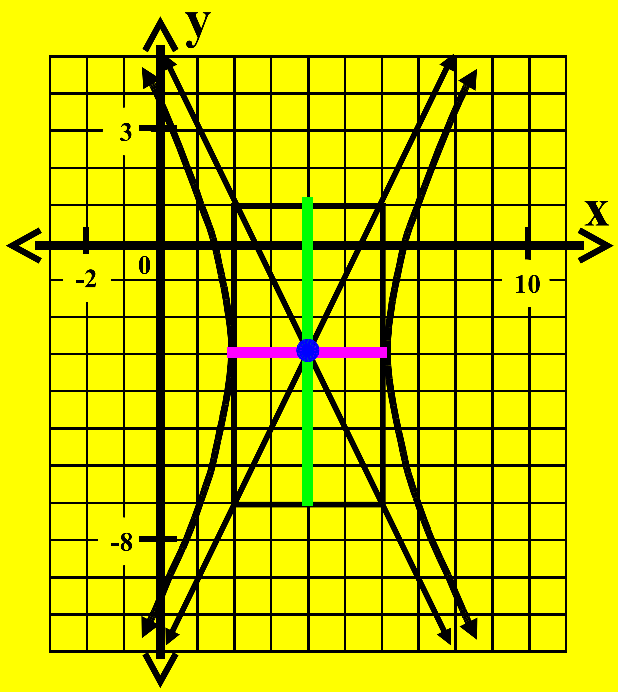

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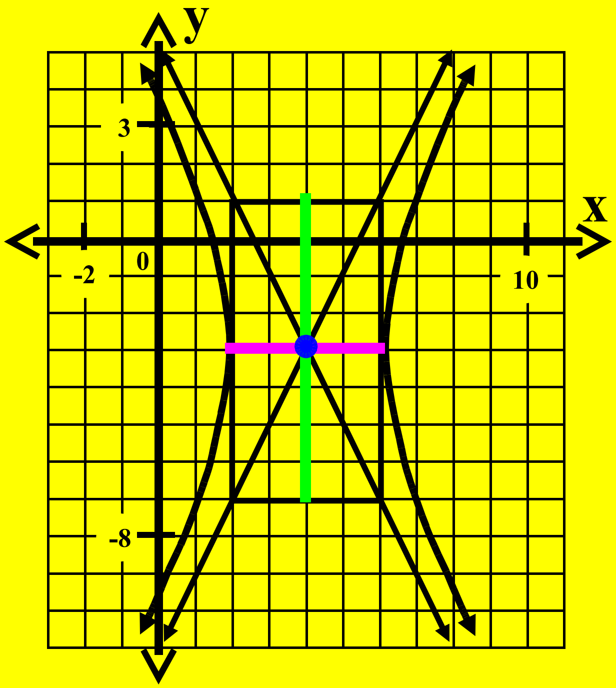

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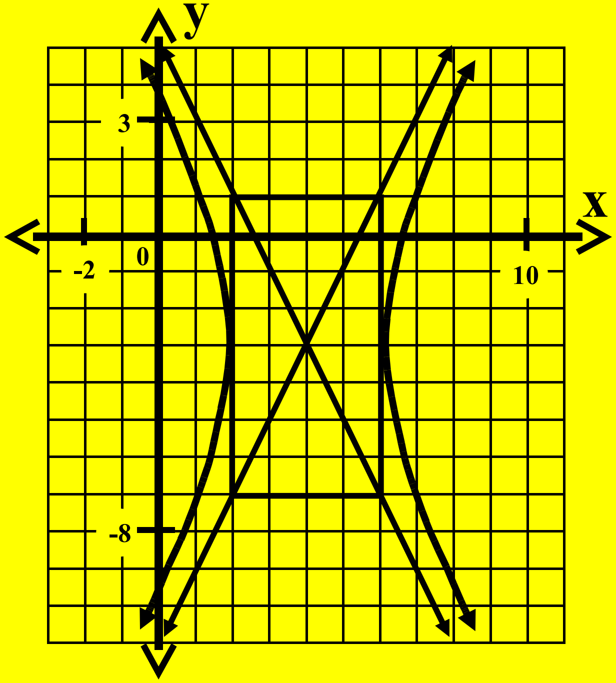

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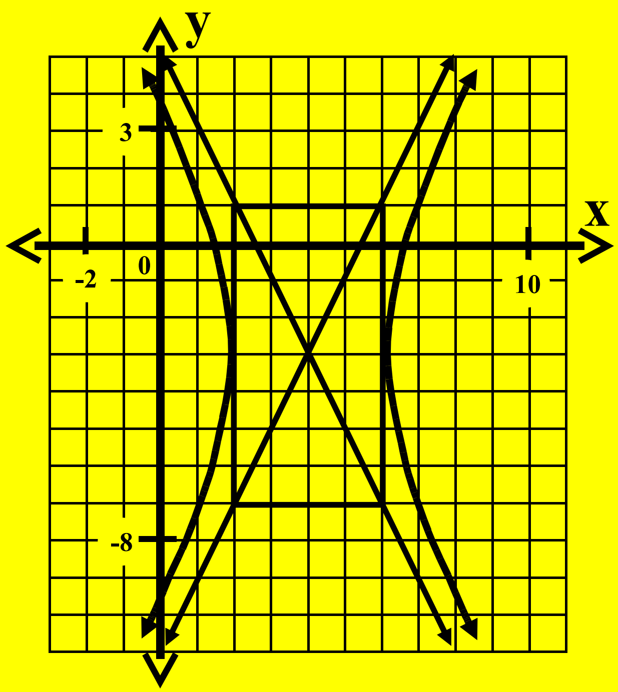

This a type 1 Hyperbola.
(The transverse axis is horizontal.)

Standard Form Equation

$$\frac{(x-4)^2}{4} - \frac{(y+3)^2}{16} = 1$$

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

Class Worksheet #3

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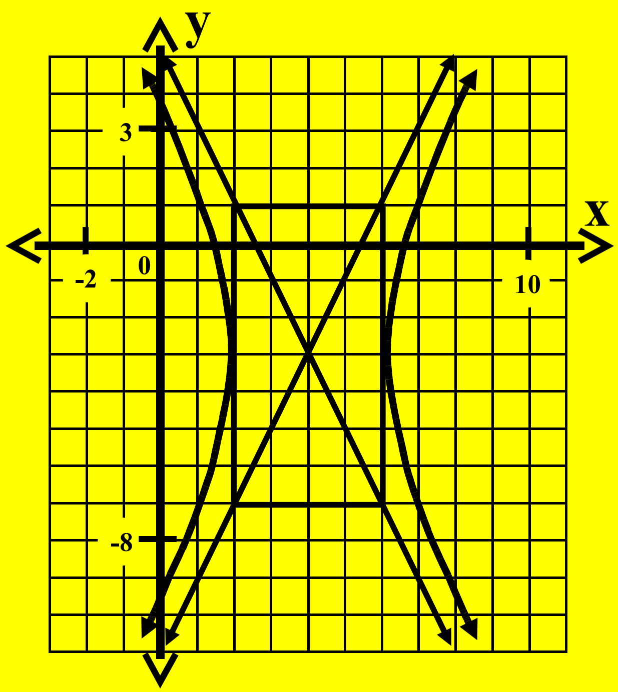

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Clear the fractions.
Multiply both sides by 16.

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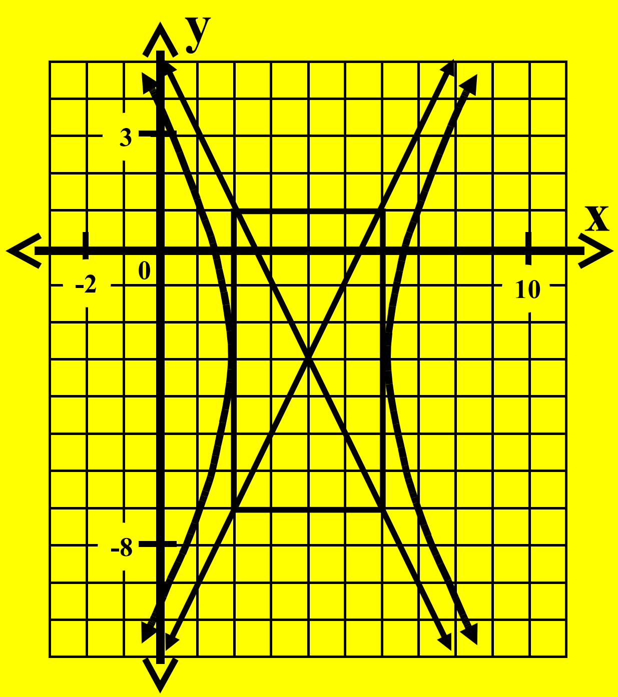

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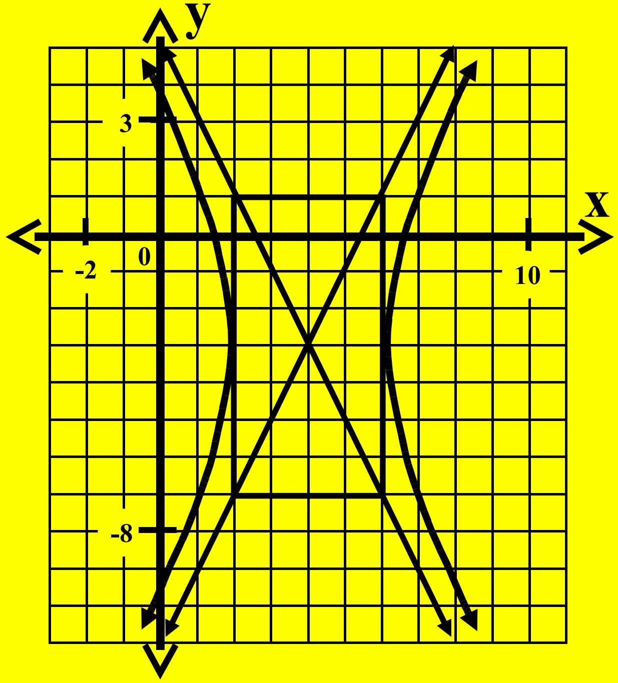

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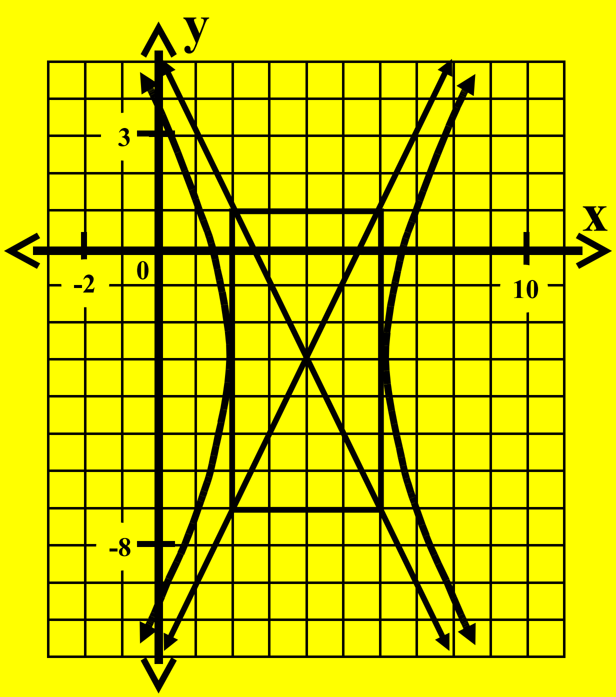

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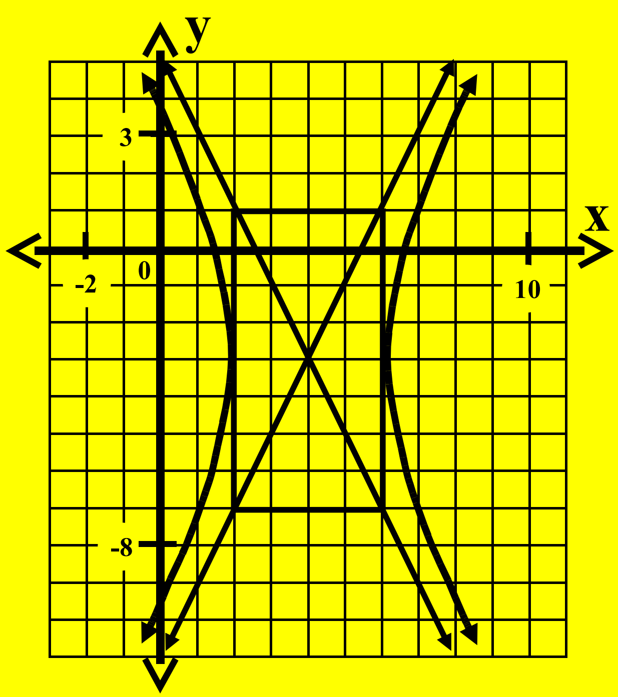

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General Form Equation

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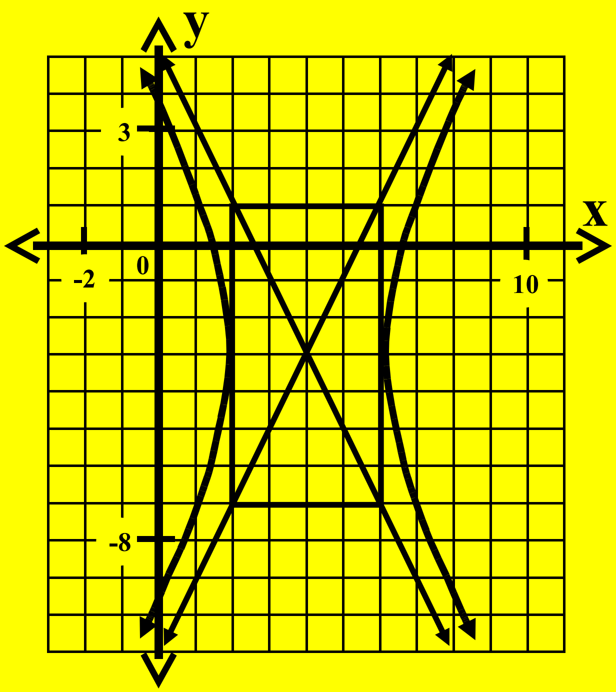

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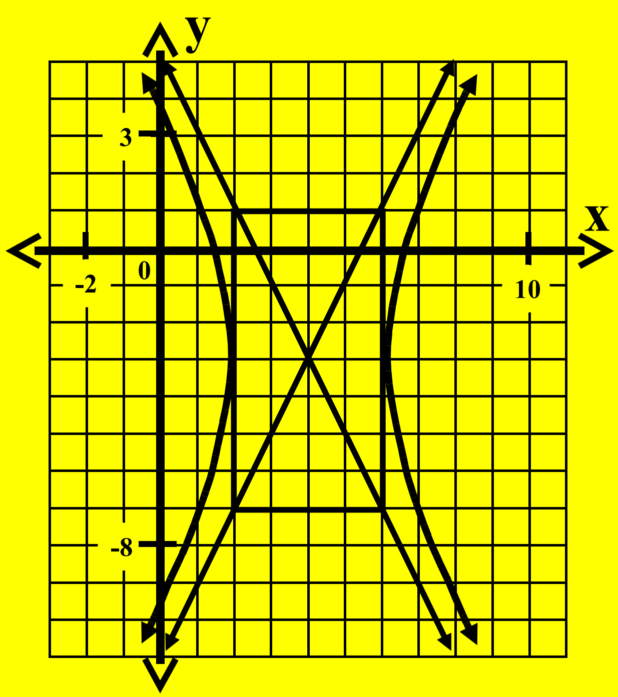

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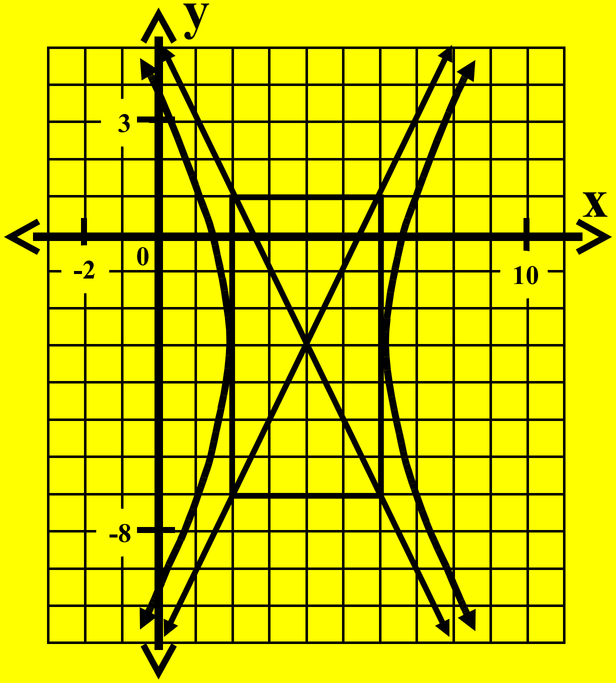

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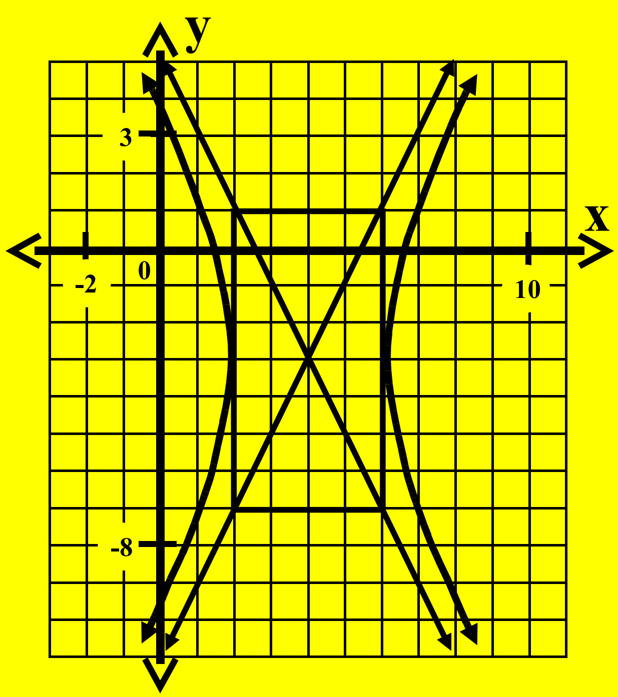

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Square the binomials

General Form Equation

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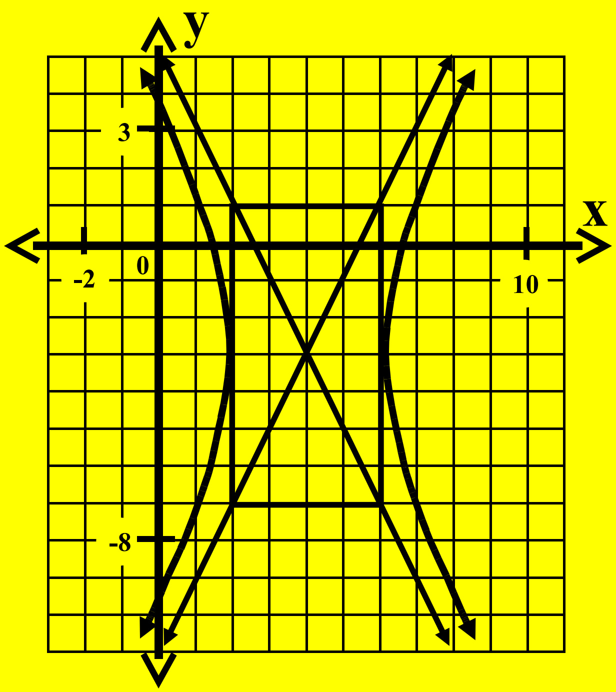

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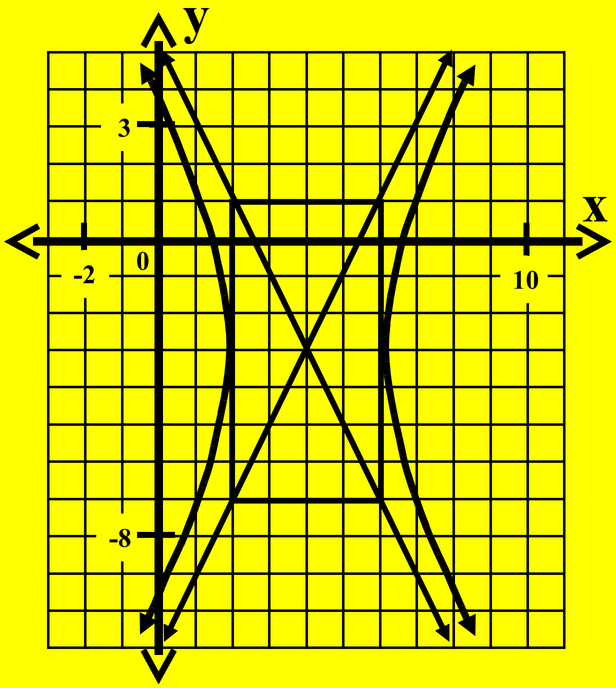

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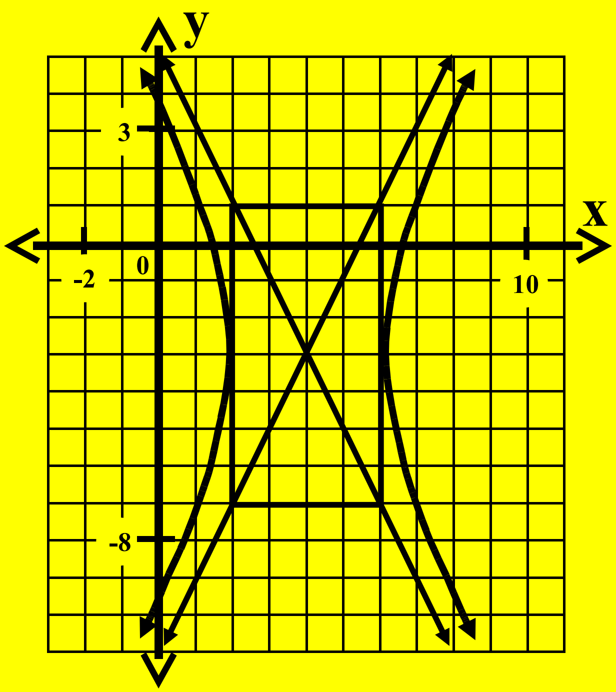

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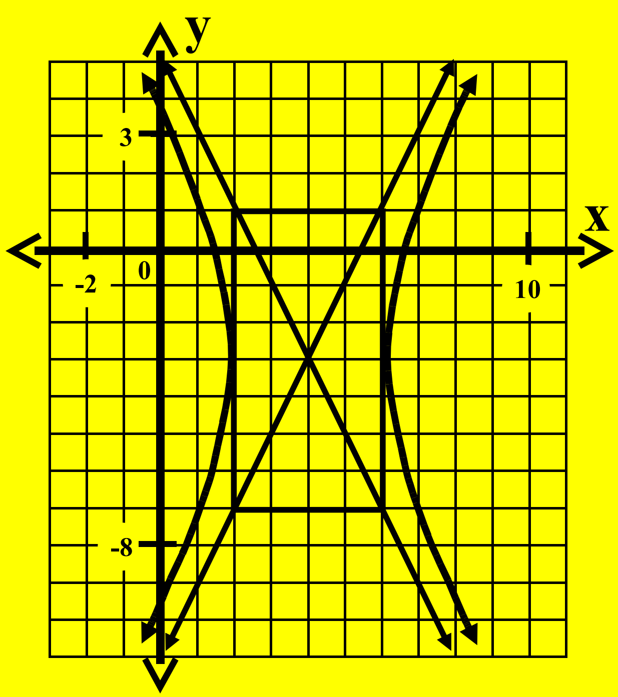

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$$4(x^2 - 8x$$

Square the binomials

General Form Equation

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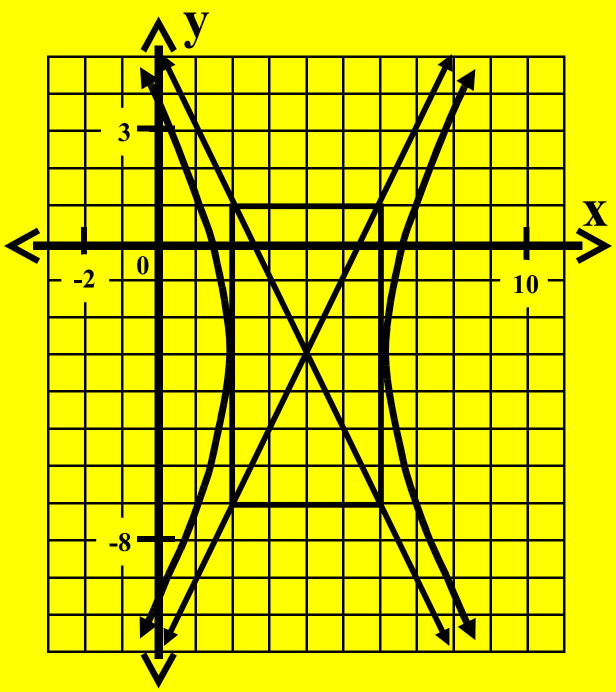

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$$4(x^2 - 8x + 16)$$

Square the binomials

General Form Equation

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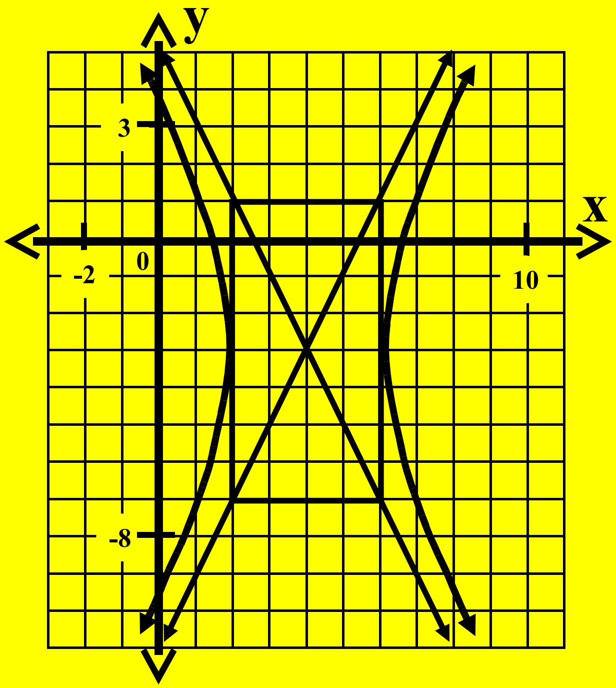

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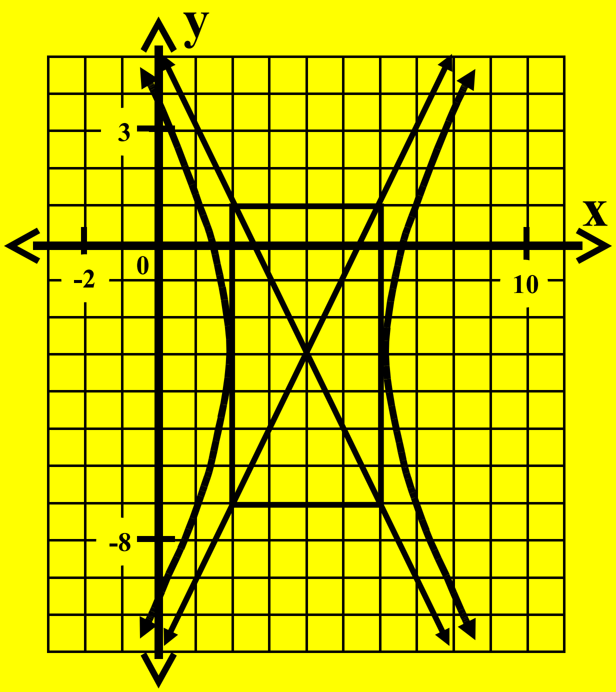

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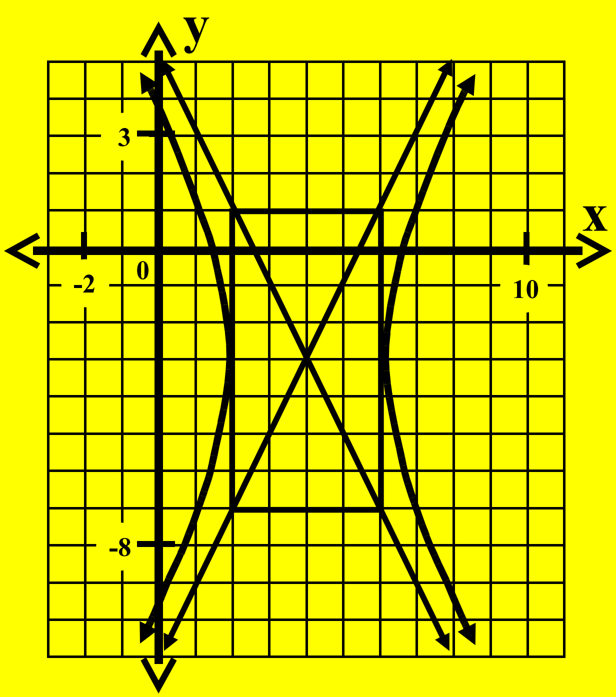

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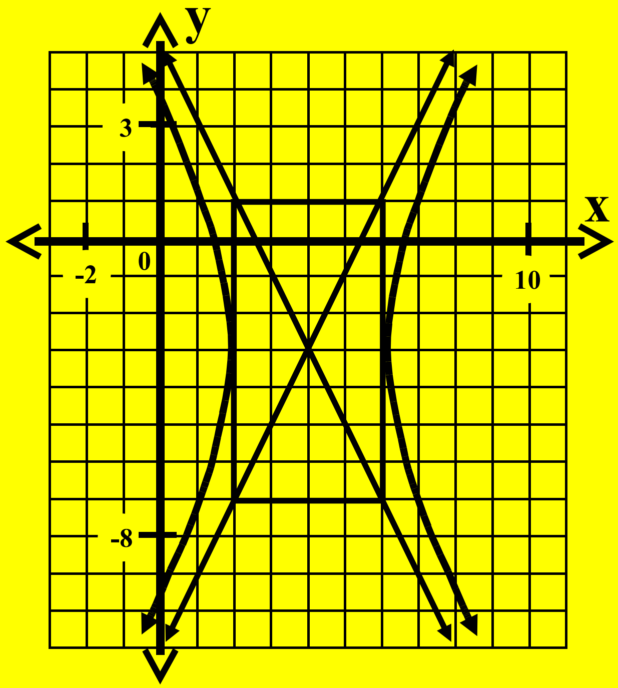

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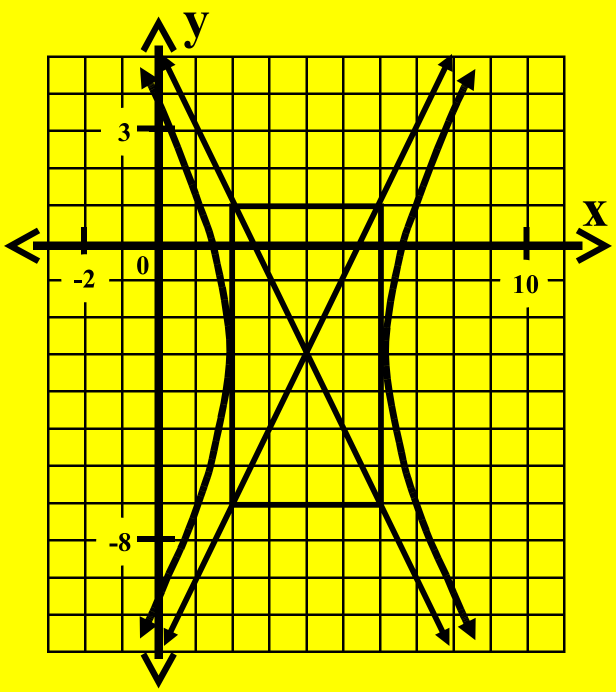

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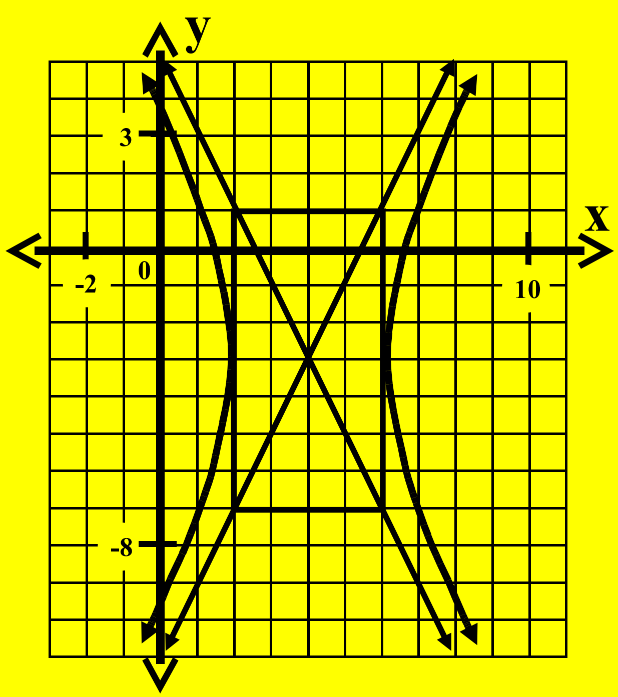

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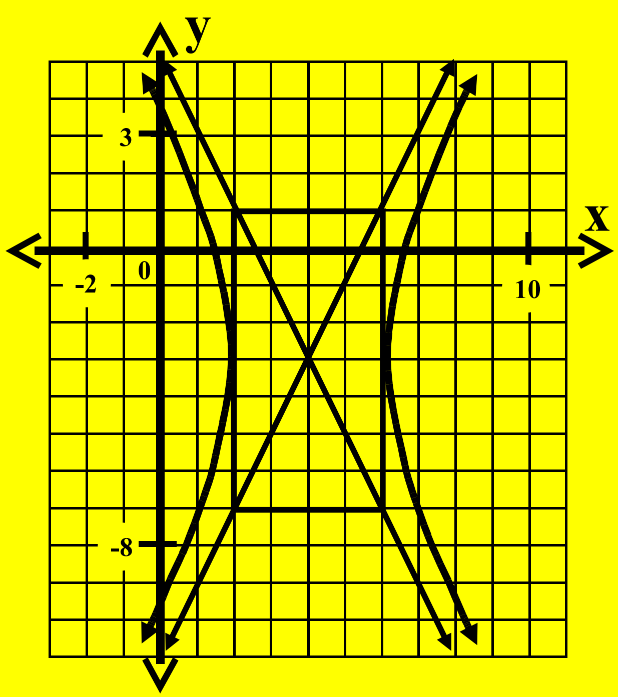

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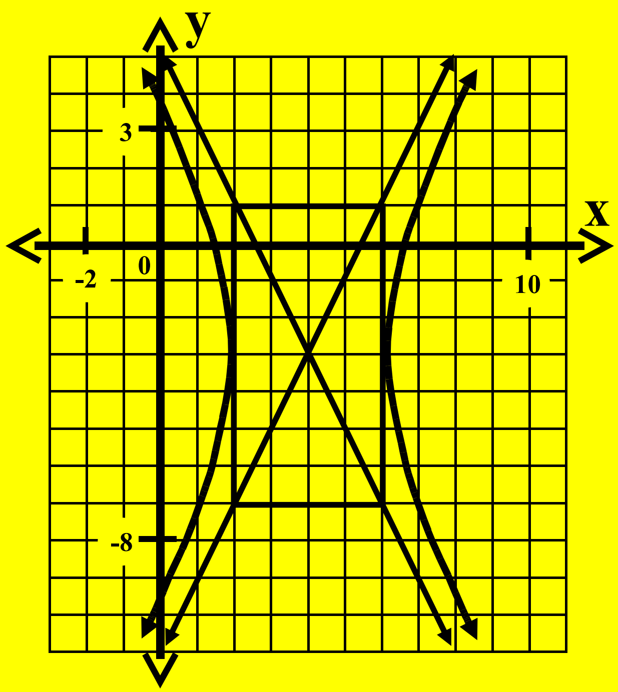

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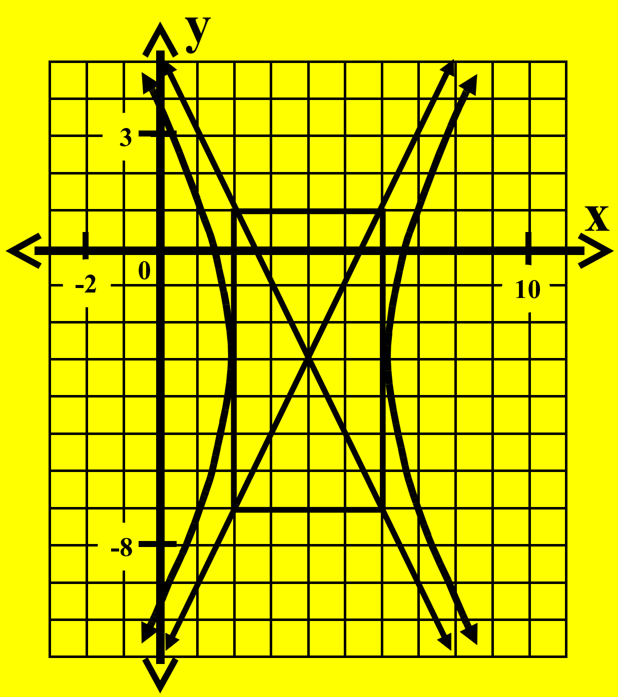

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Perform the indicated multiplication.

General Form Equation

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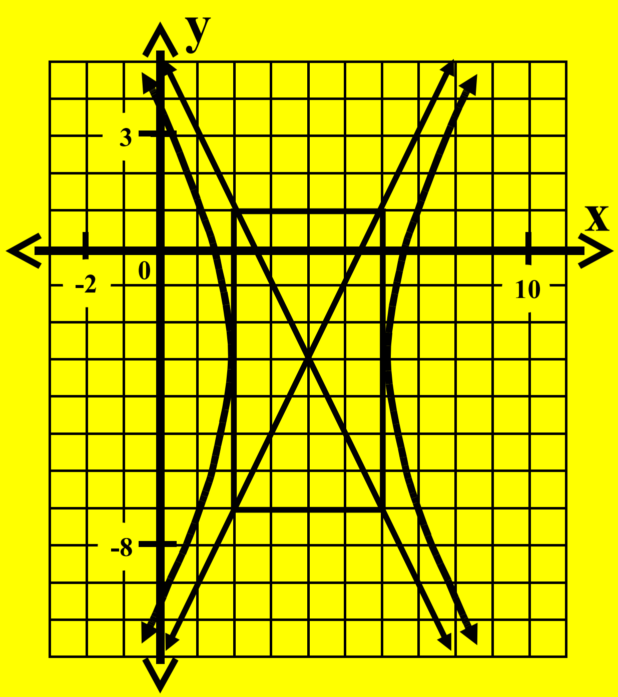

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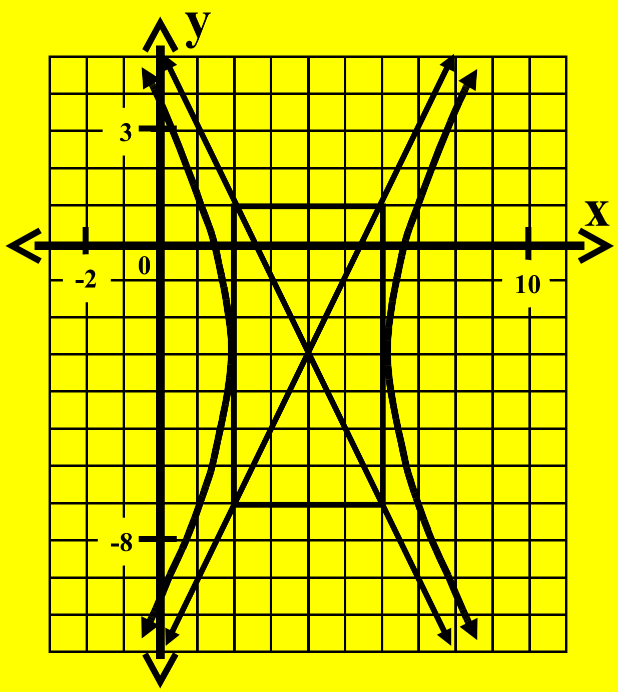

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$$4x^2$$

Perform the indicated multiplication.

General Form Equation

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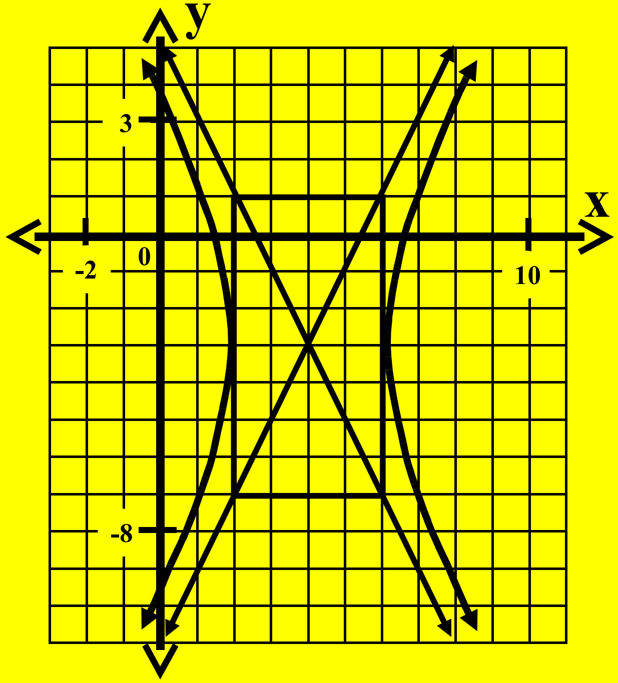

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$$4x^2 - 32x$$

Perform the indicated multiplication.

General Form Equation

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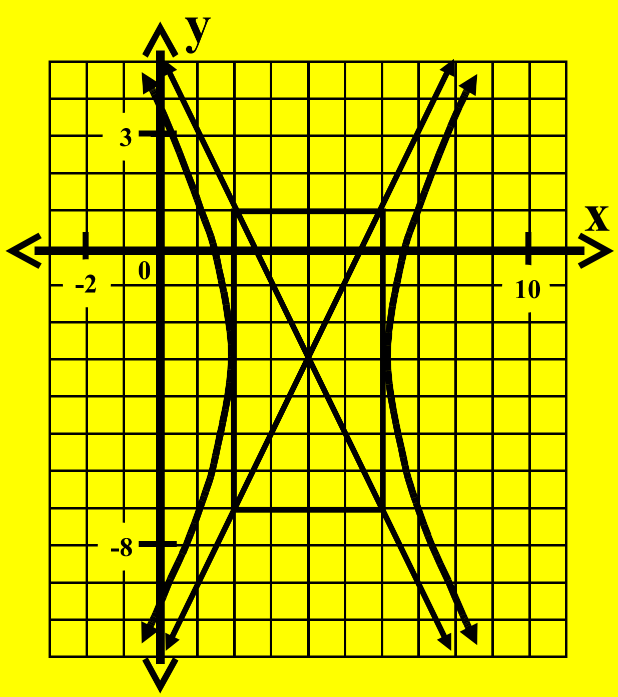

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$$4(x-4)^2 - 1(y+3)^2 = 16$$

$$4(x^2 - 8x + 16) - 1(y^2 + 6y + 9) = 16$$

$$4x^2 - 32x + 64$$

Perform the indicated multiplication.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

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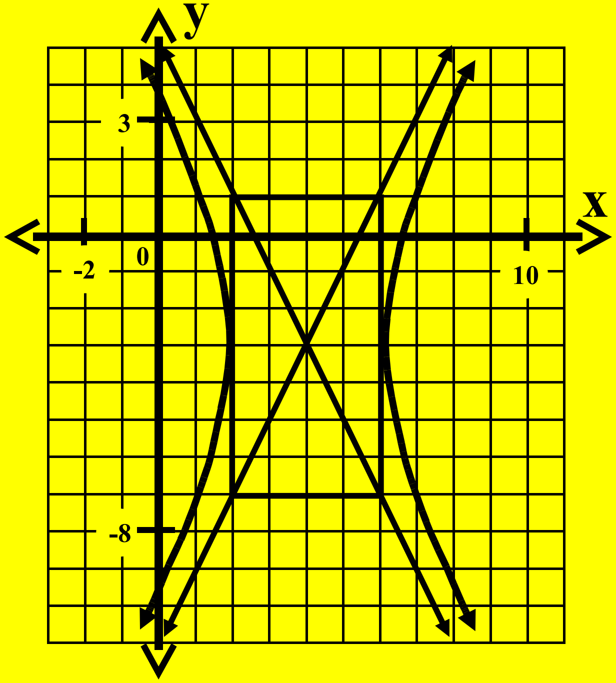

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$$4x^2 - 32x + 64$$

Perform the indicated multiplication.

General Form Equation

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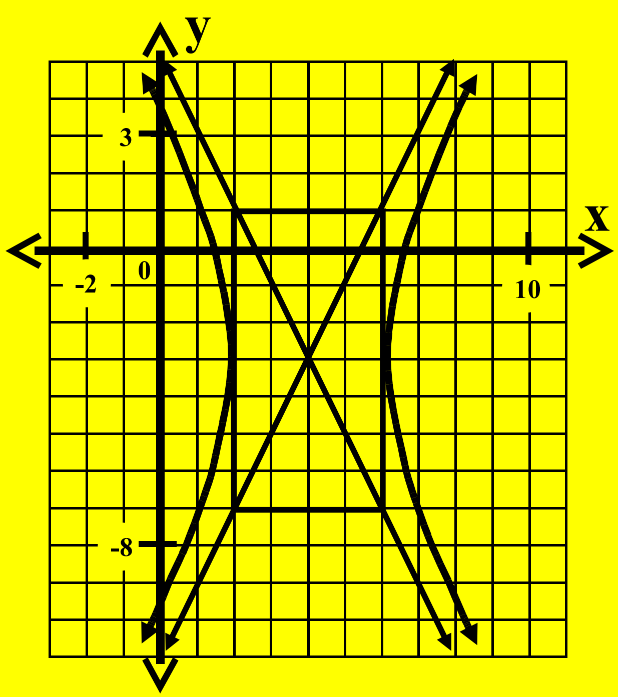

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$$4x^2 - 32x + 64 - 1y^2$$

Perform the indicated multiplication.

General Form Equation

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$$AC < 0$$

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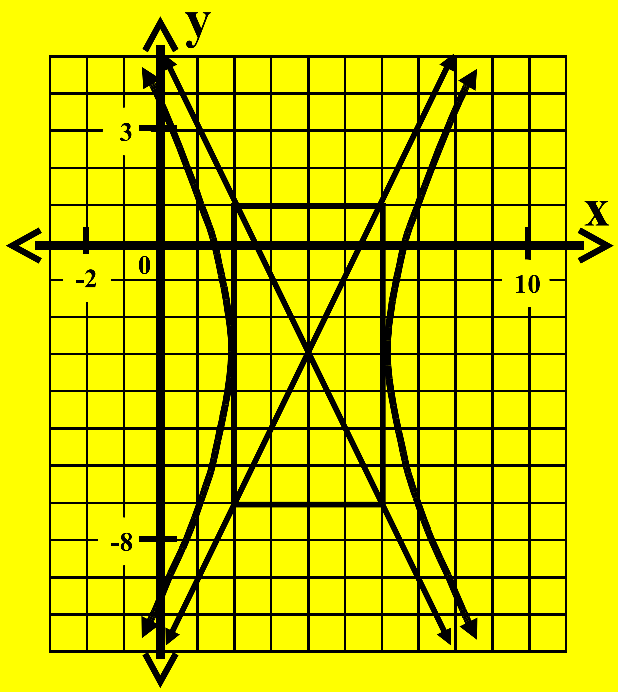

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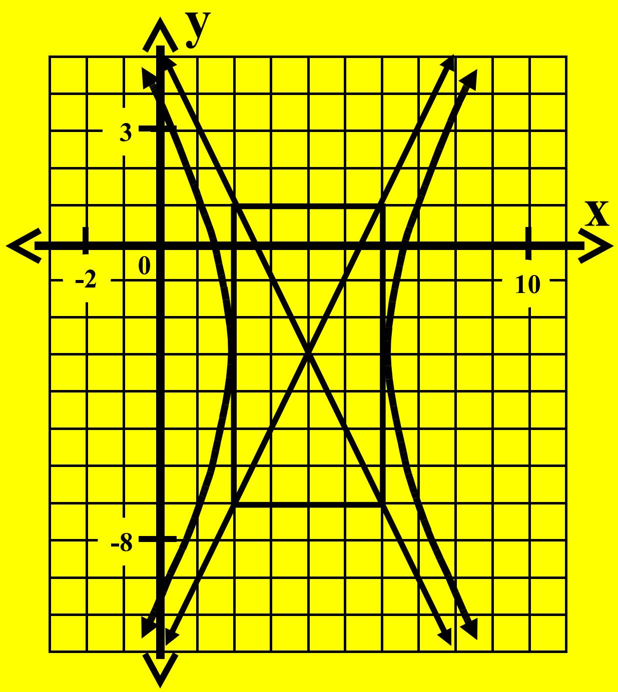

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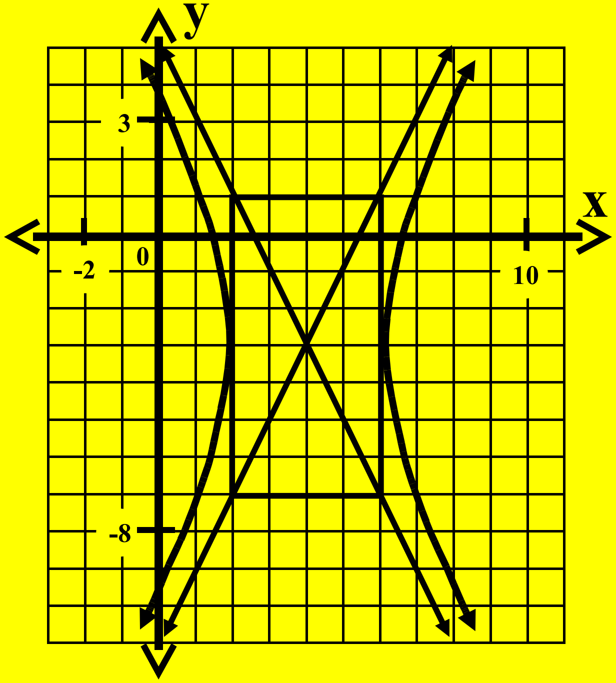

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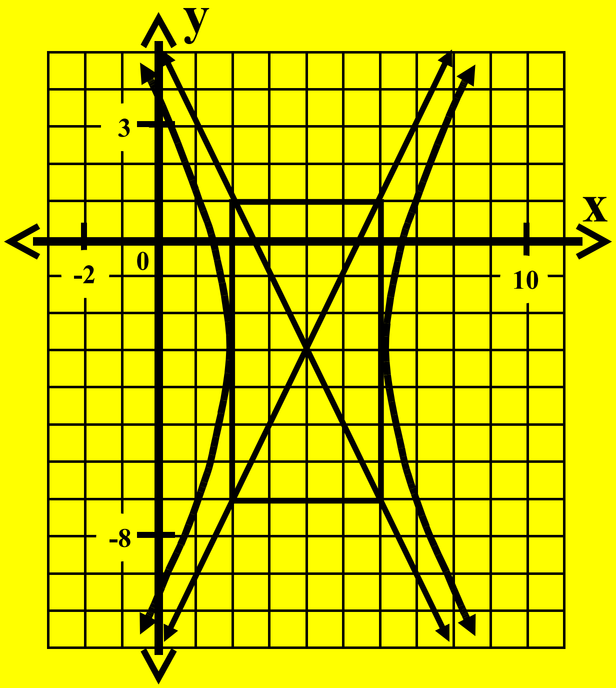

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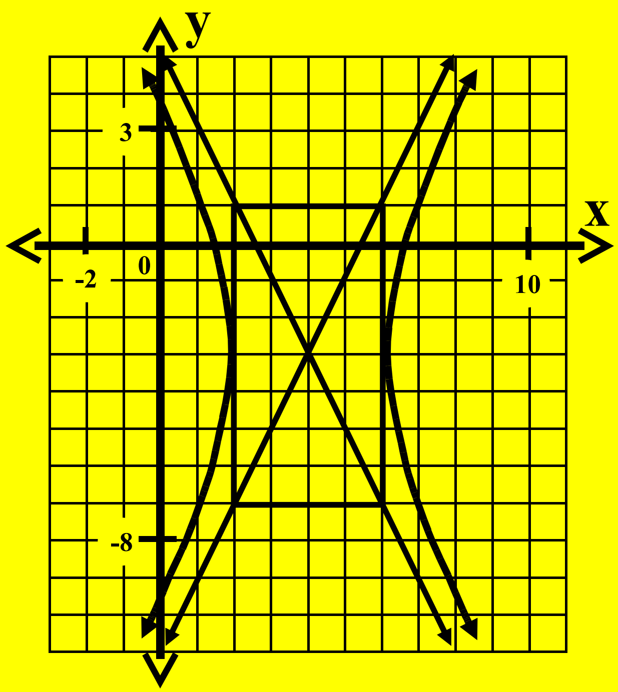

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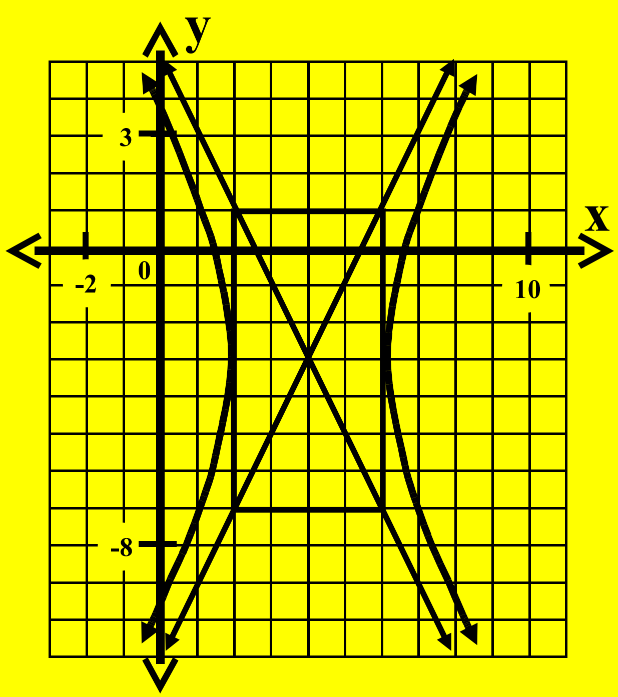

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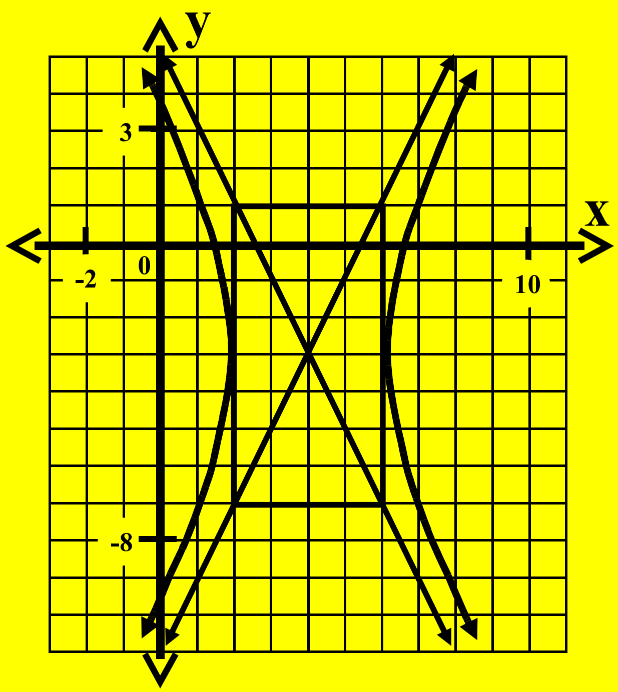

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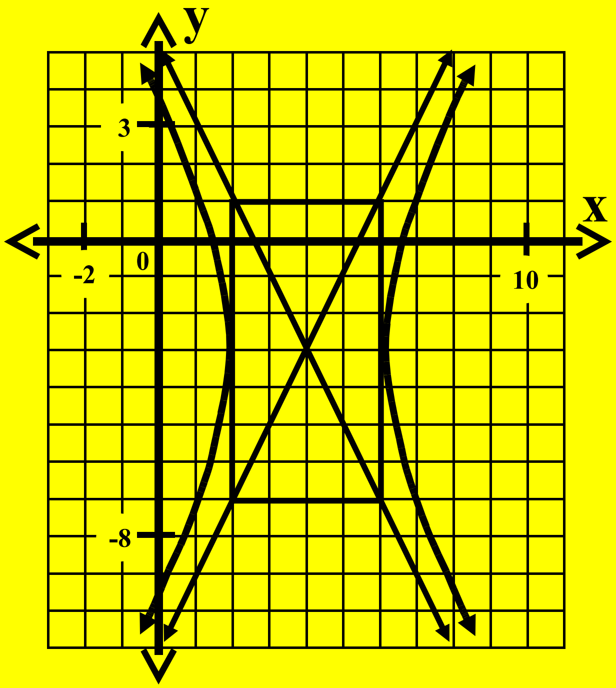

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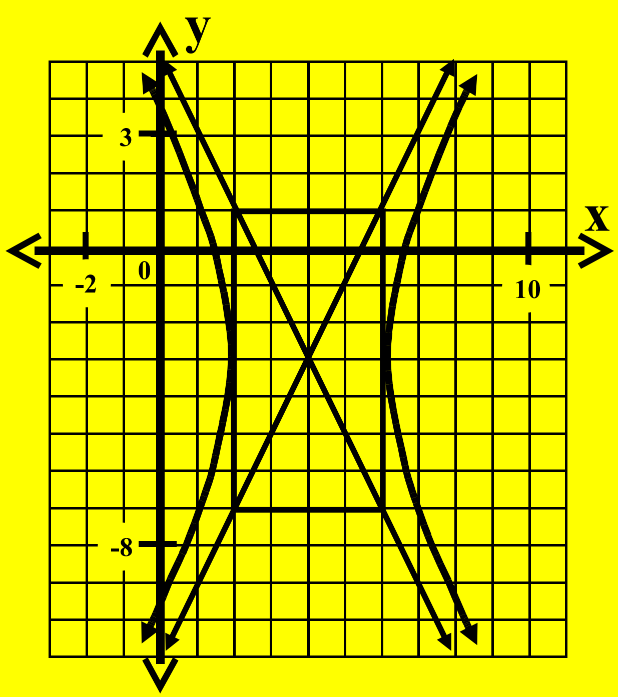

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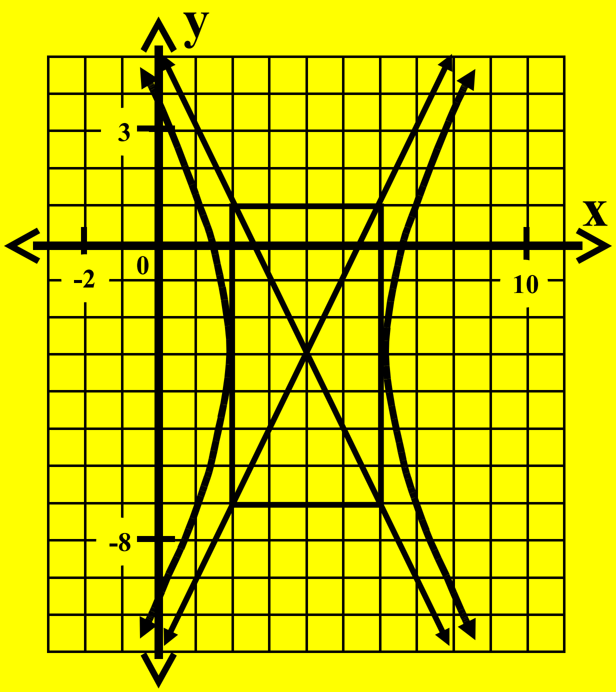

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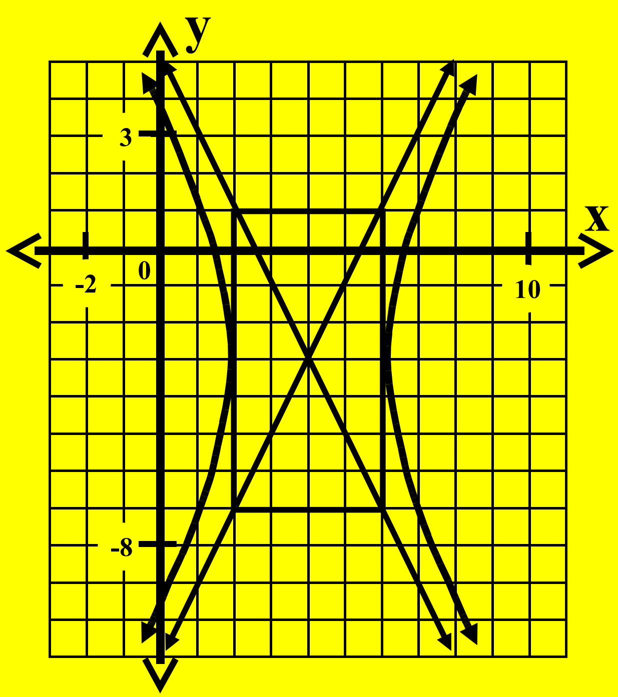

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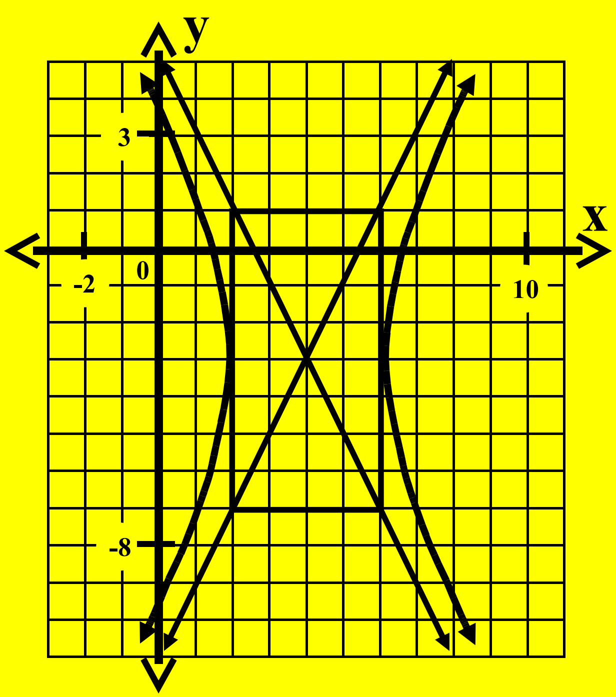

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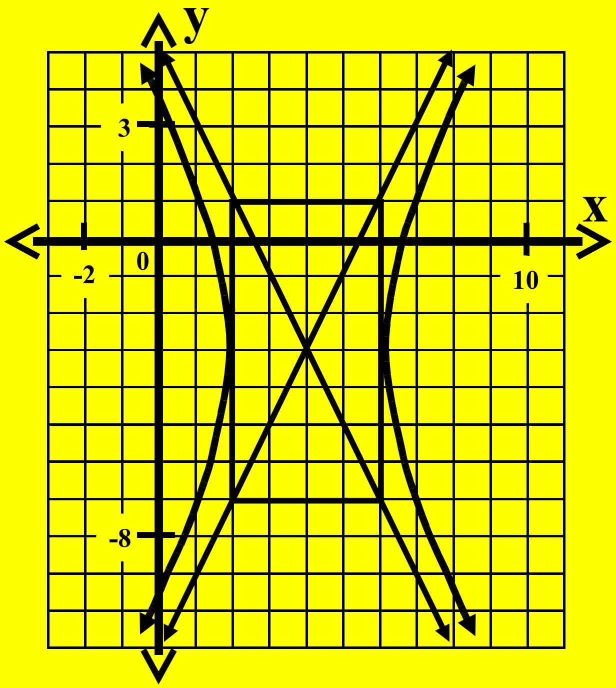

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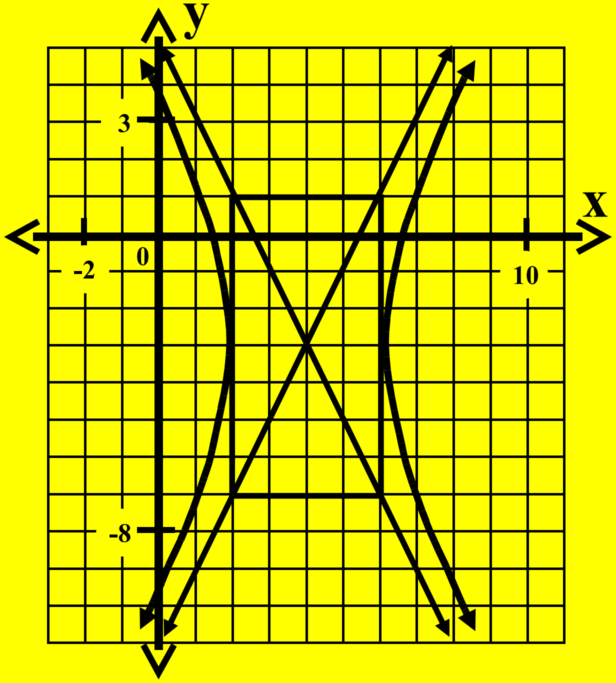

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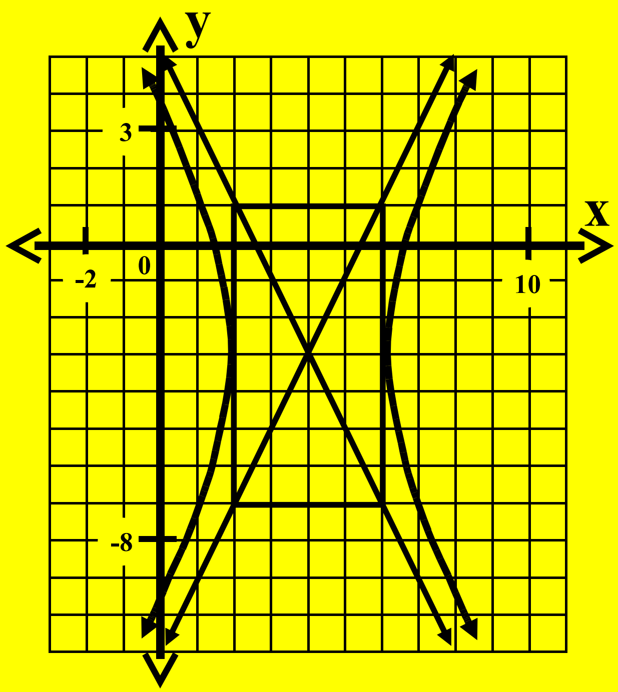

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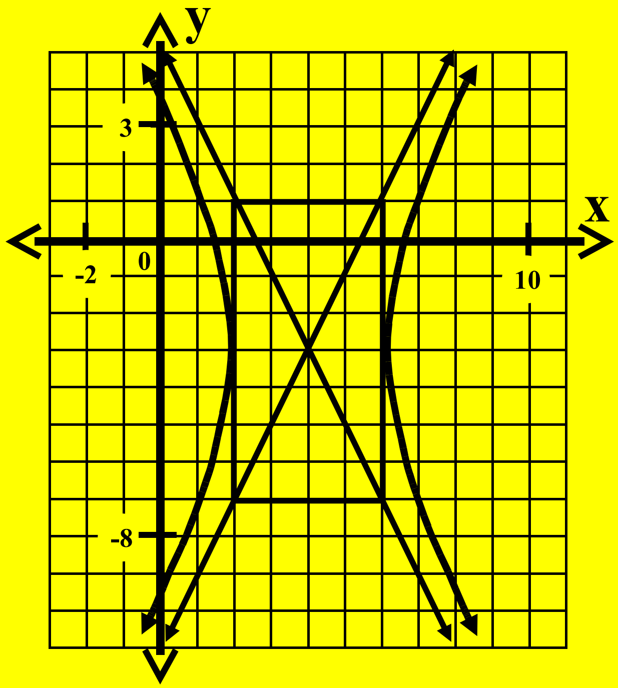

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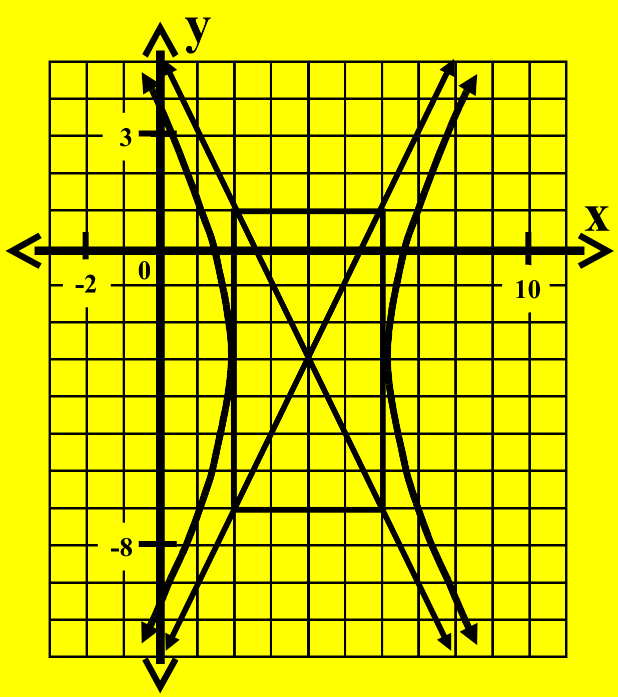

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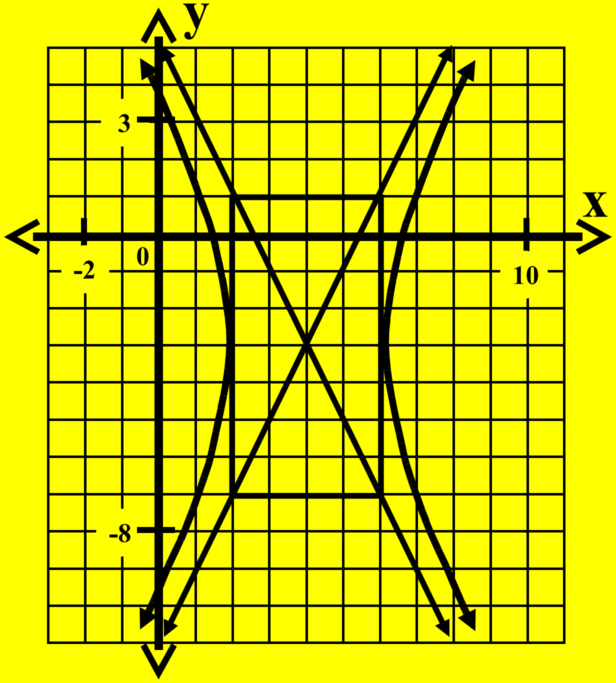

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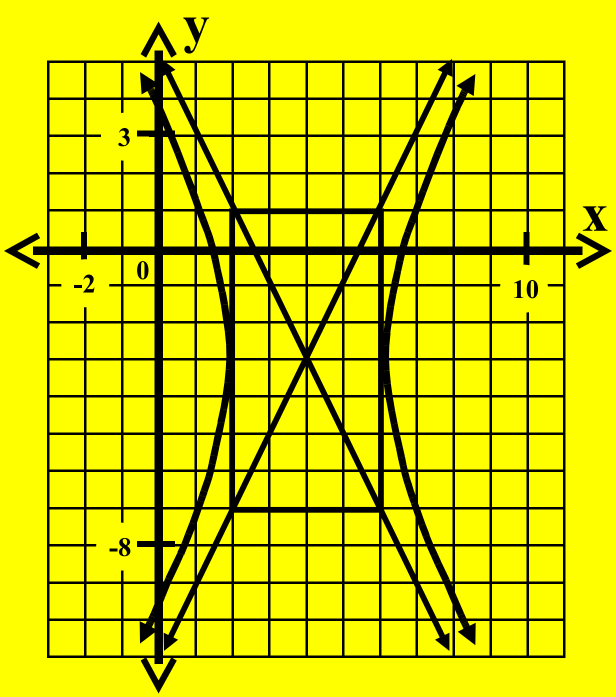

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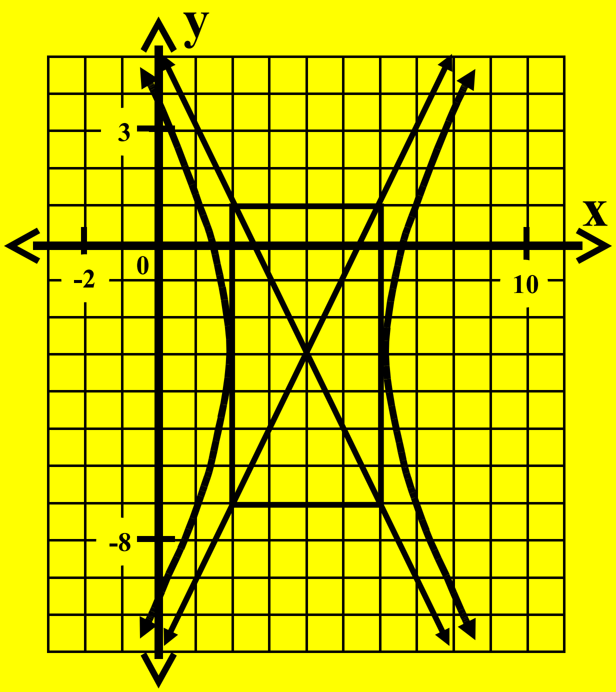

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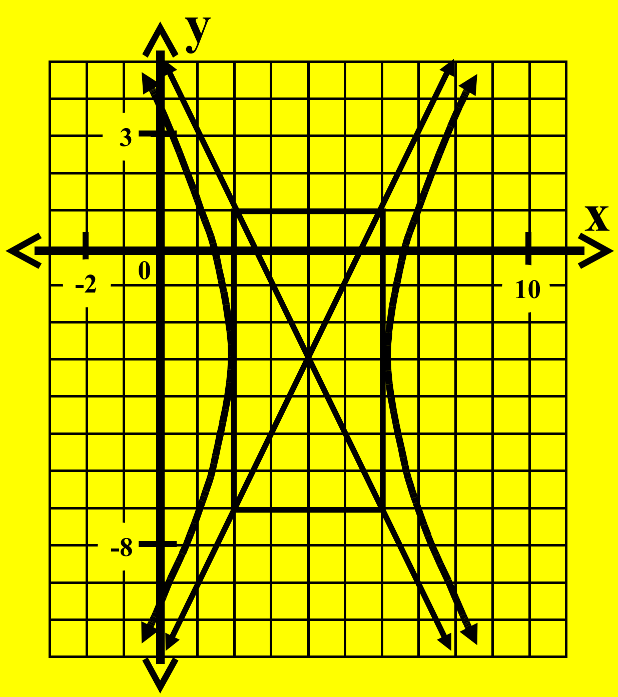

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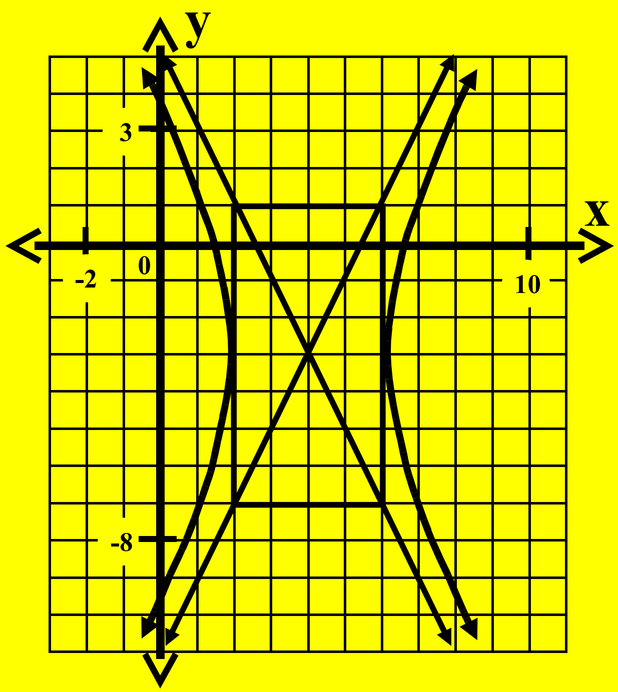

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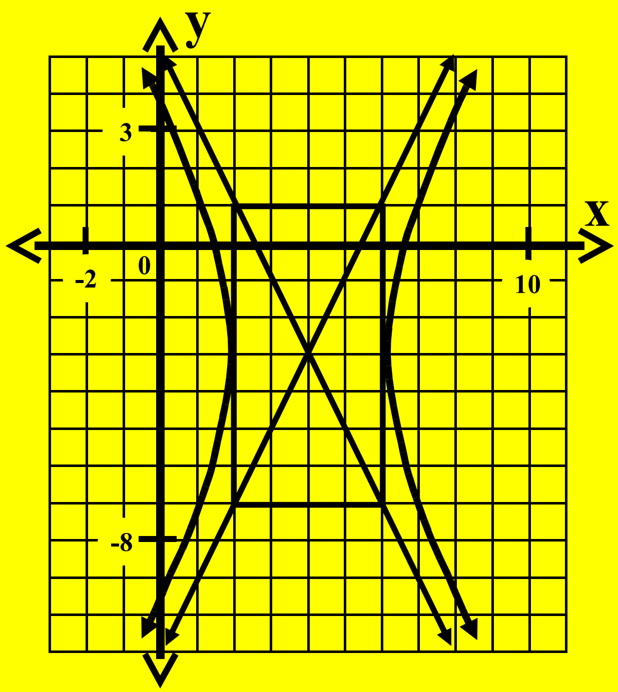

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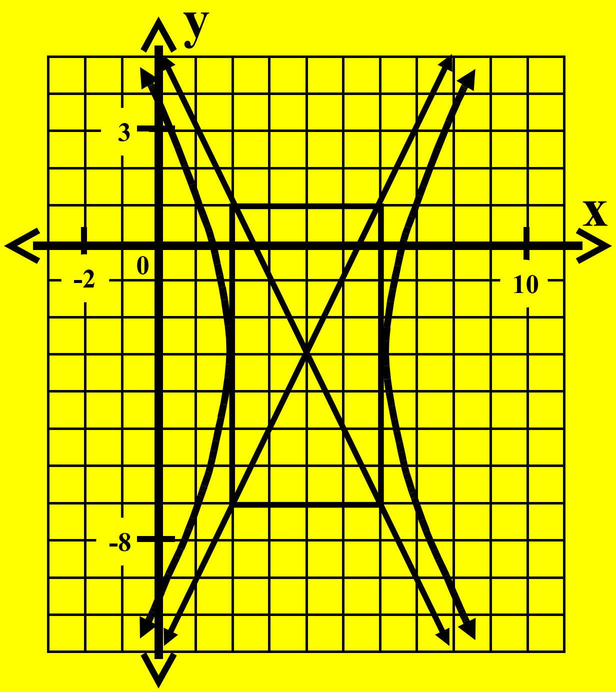

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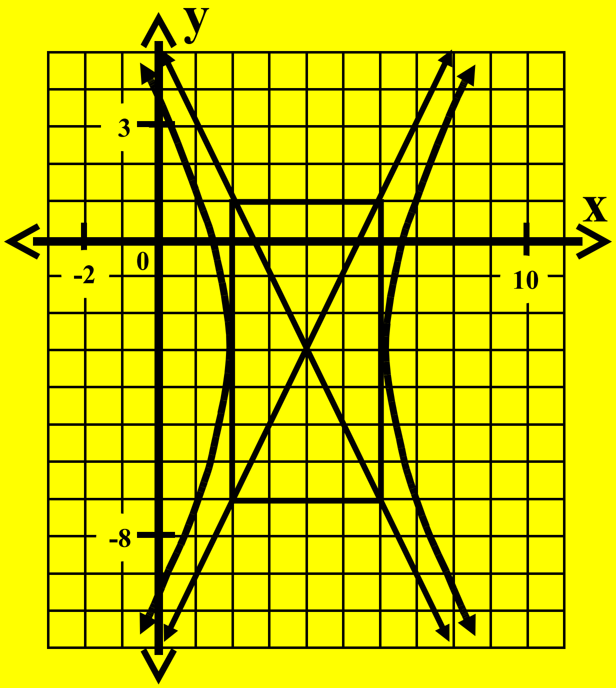

This a type 1 Hyperbola.
(The transverse axis is horizontal.)

Standard Form Equation

$$\frac{(x-4)^2}{4} - \frac{(y+3)^2}{16} = 1$$

General Form Equation

$$4x^2 - y^2 - 32x - 6y + 39 = 0$$

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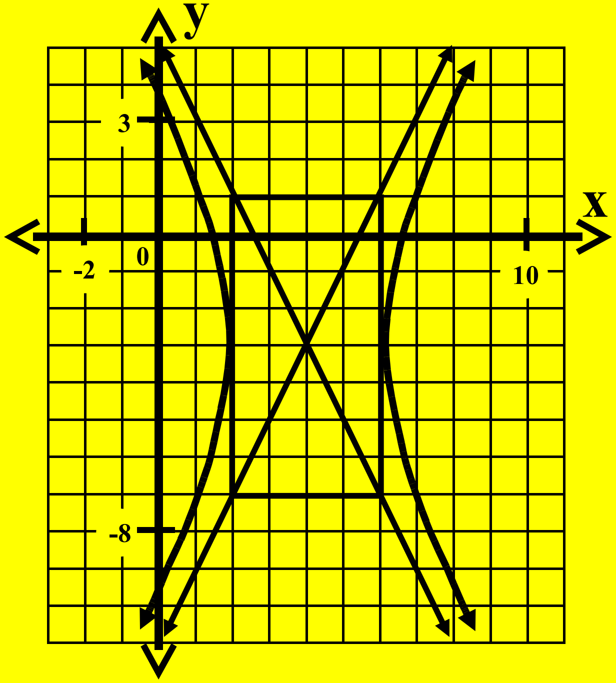

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Each focus is c units from the center

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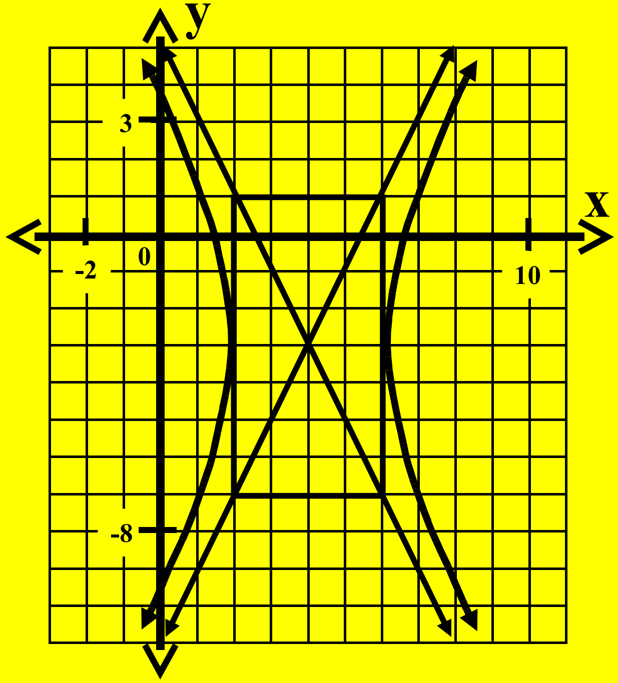

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Each focus is c units from the center where

$c^2 =$

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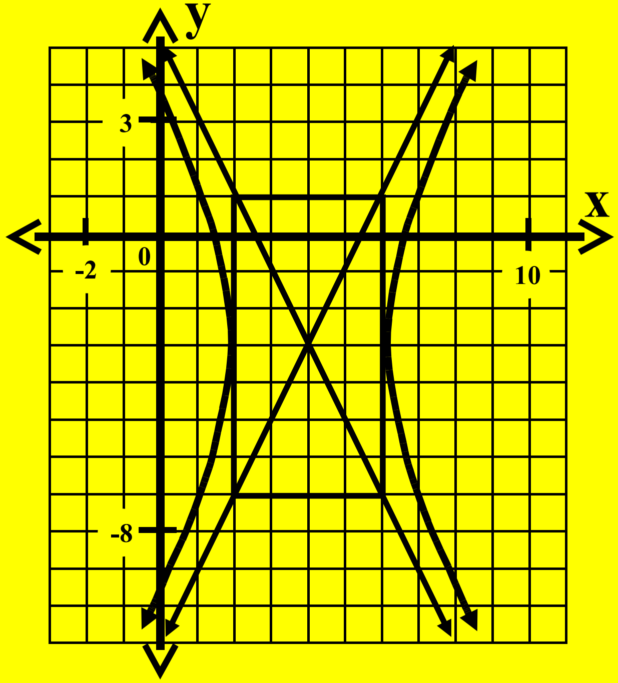

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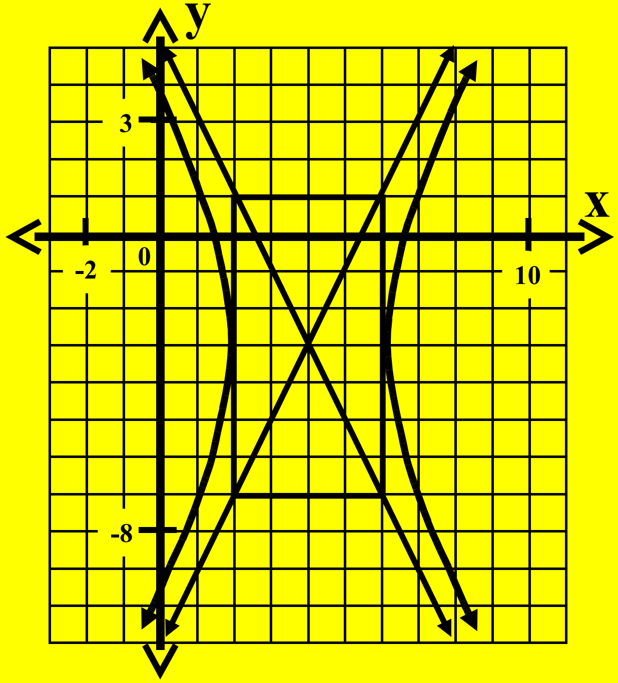

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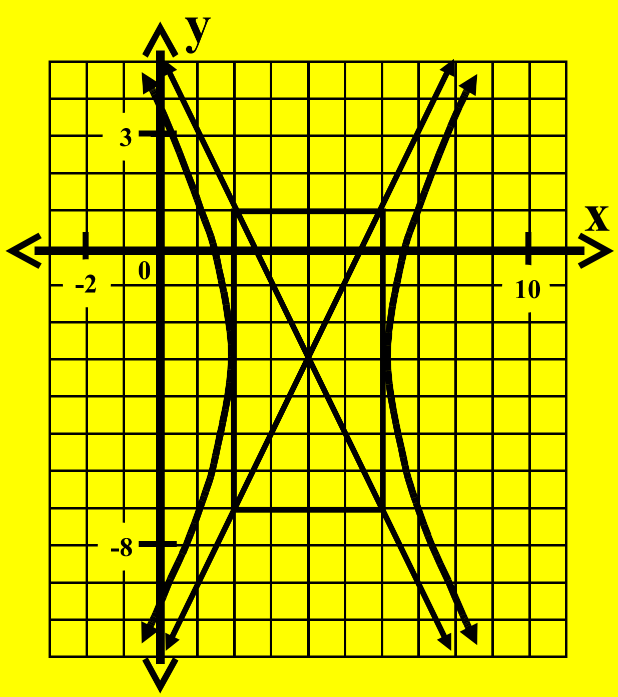

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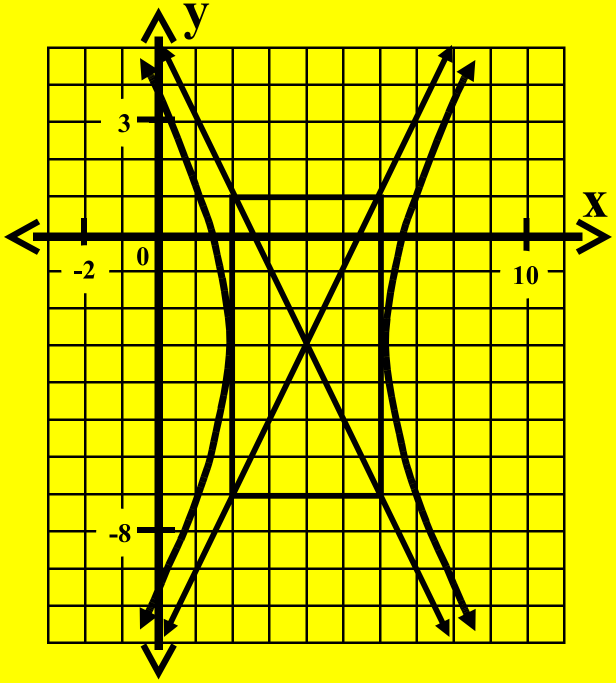

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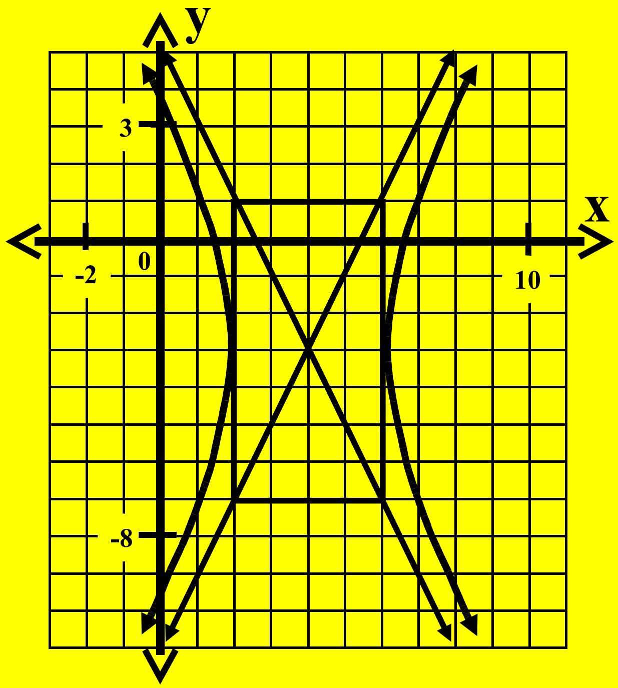

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$$a^2 = 4$$

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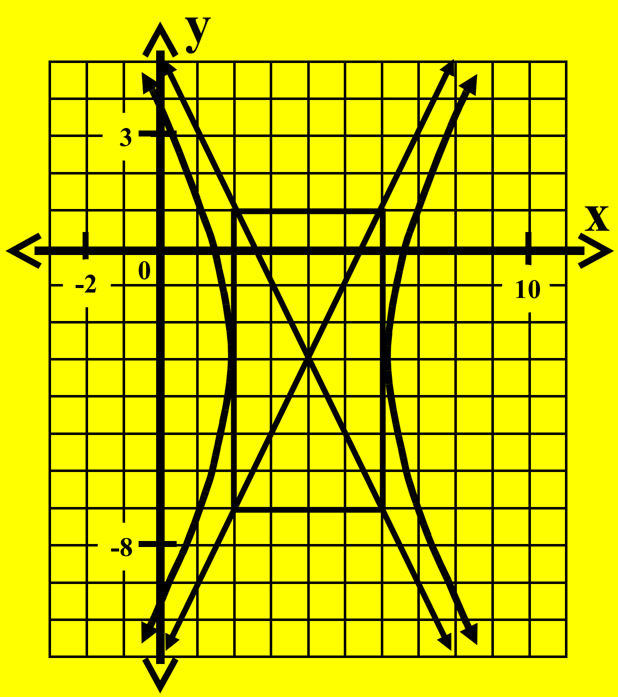

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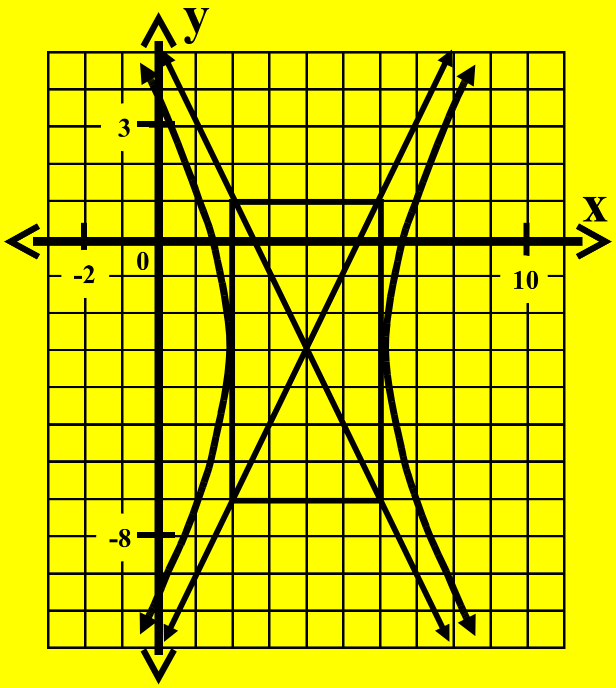

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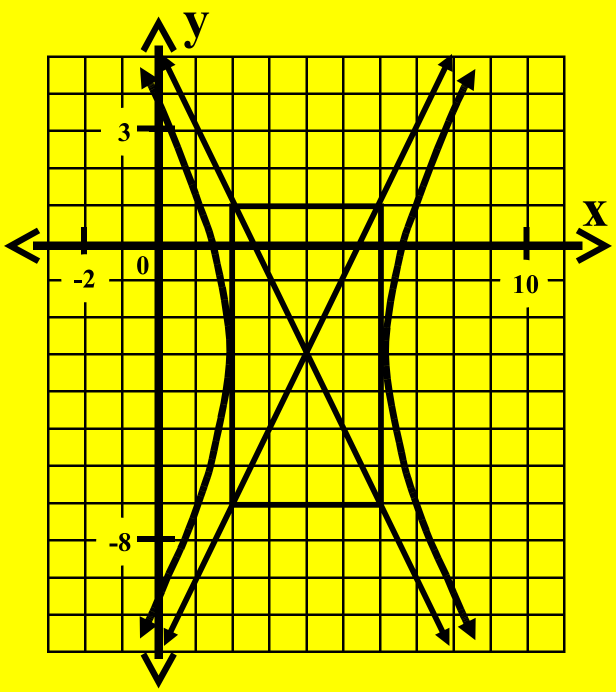

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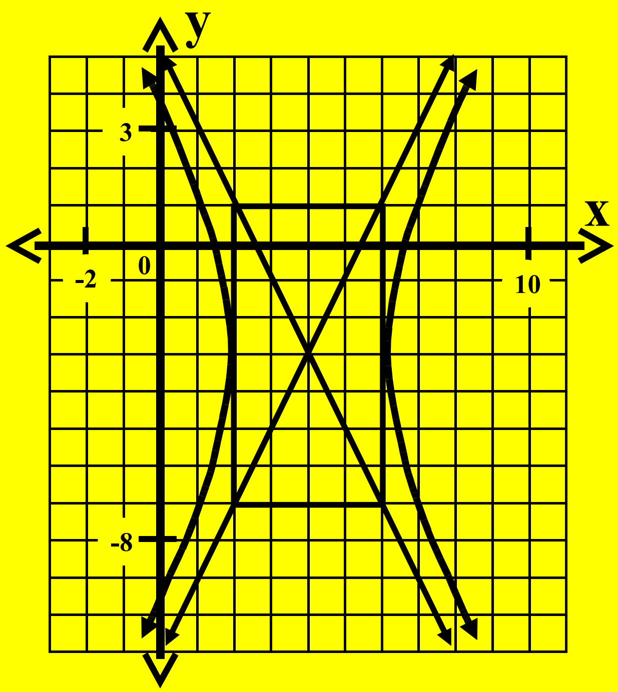

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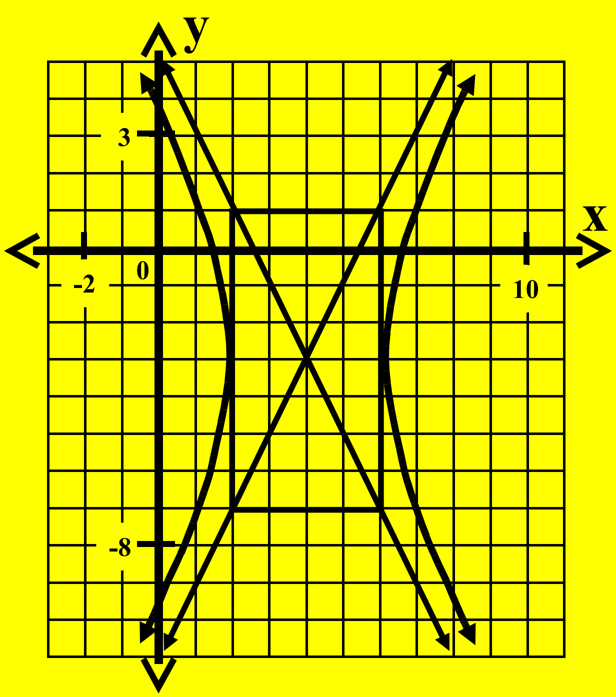

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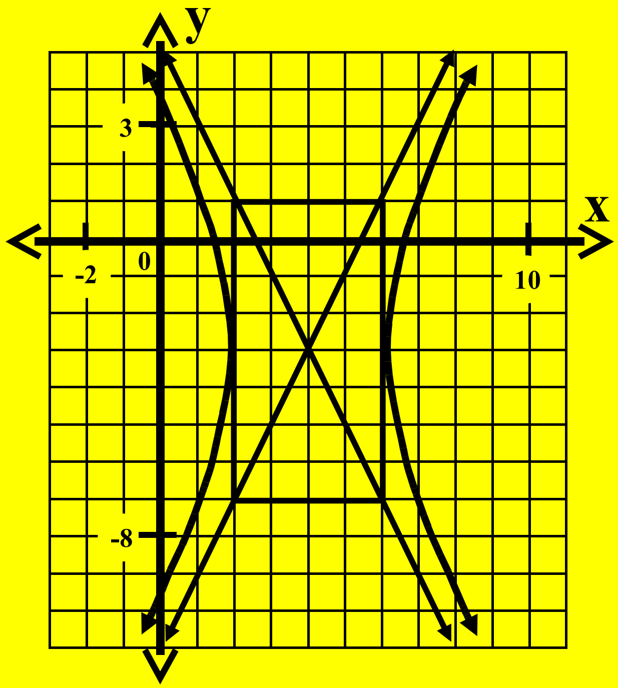

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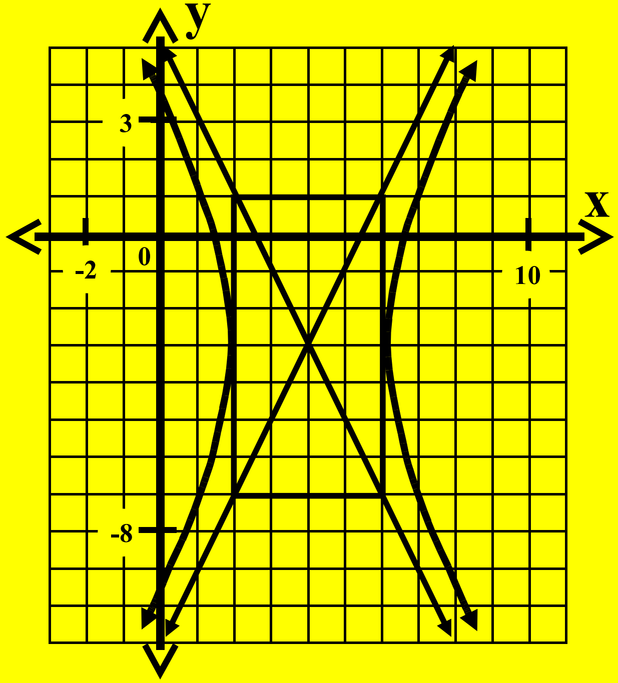

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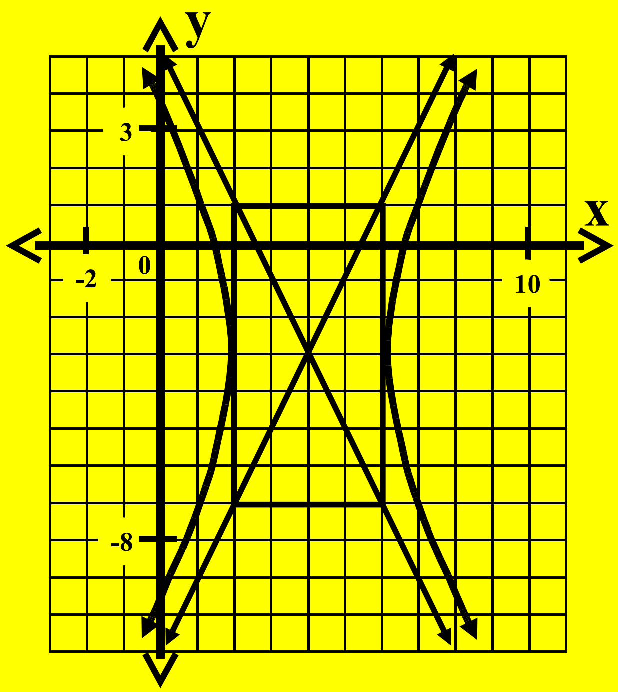

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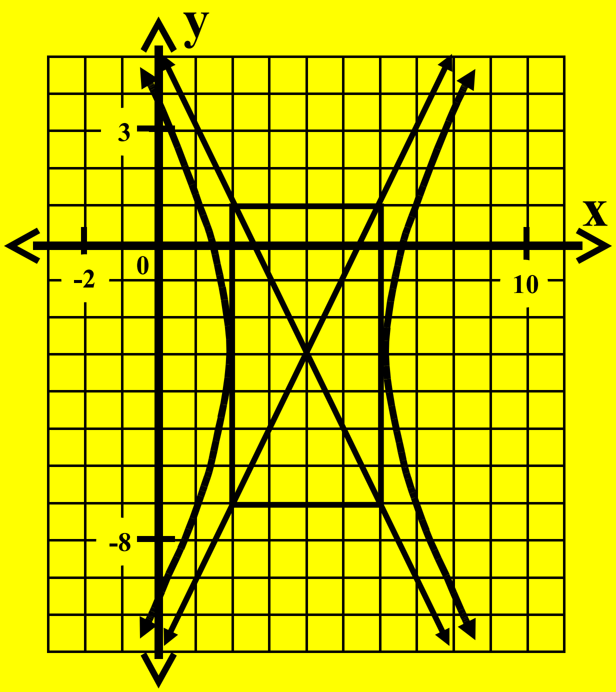

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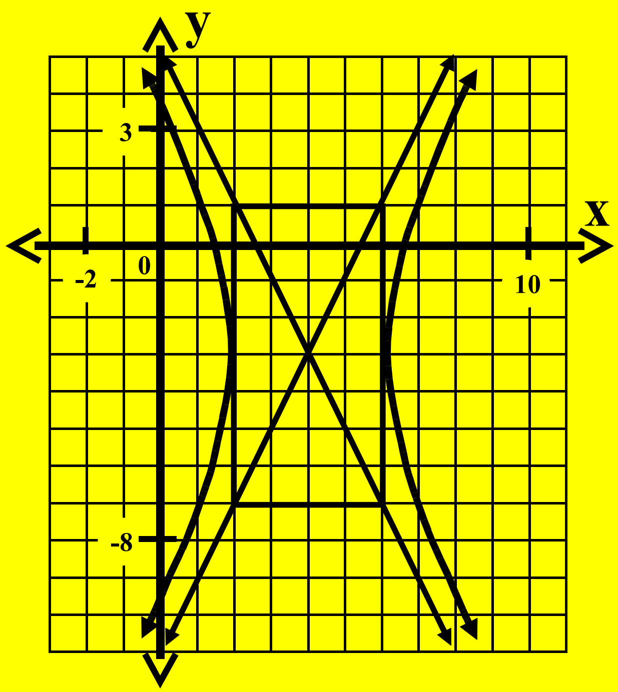

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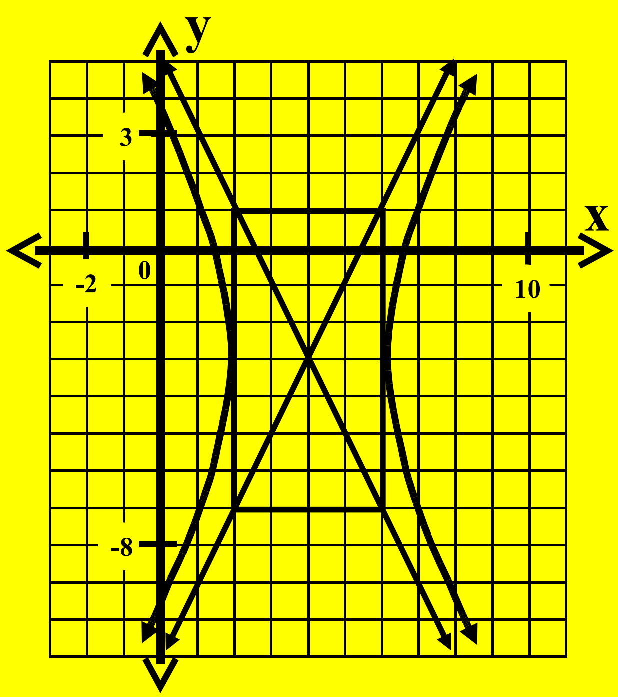

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$$c = \sqrt{20}$$

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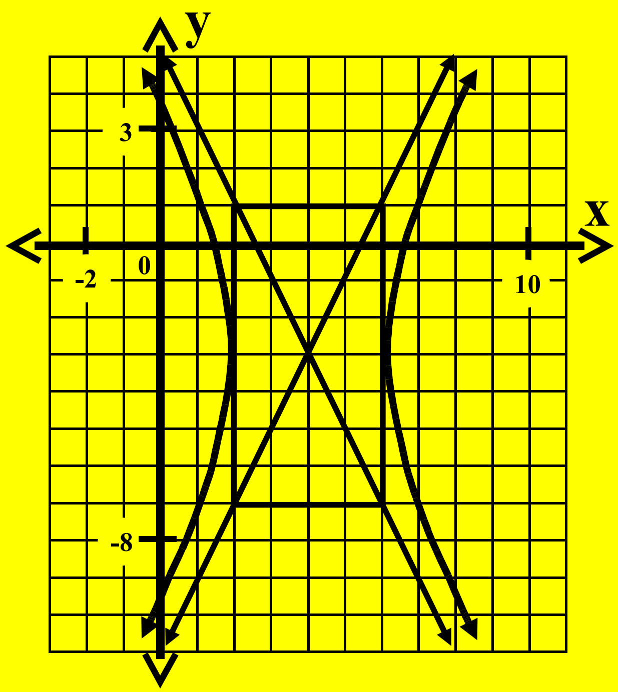

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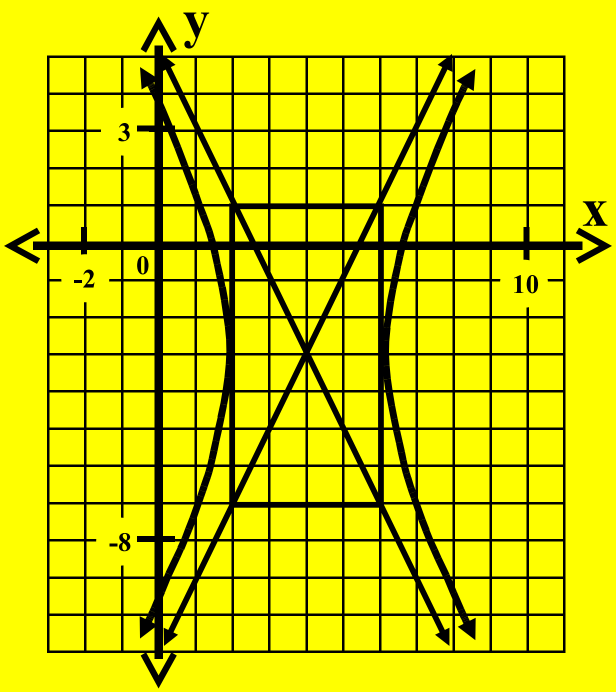

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$$c = \sqrt{20} \approx 4.5$$

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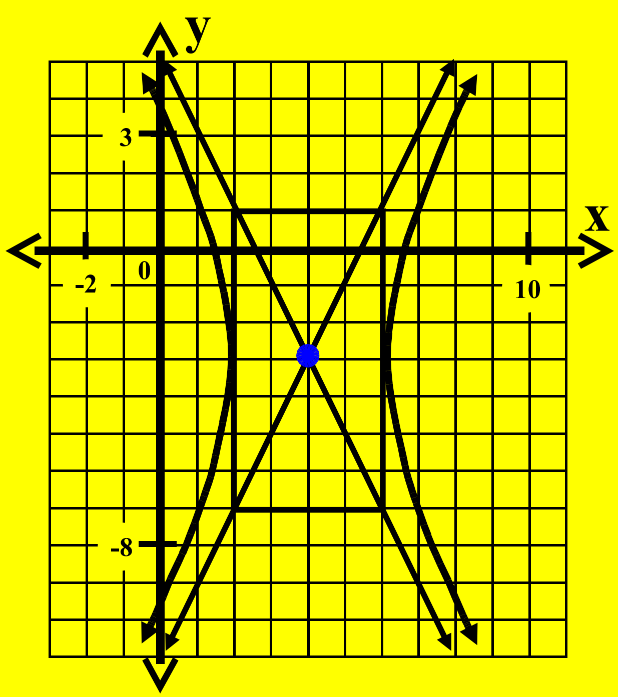

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The center of this hyperbola is (4, -3).

Each focus is c units from the center where

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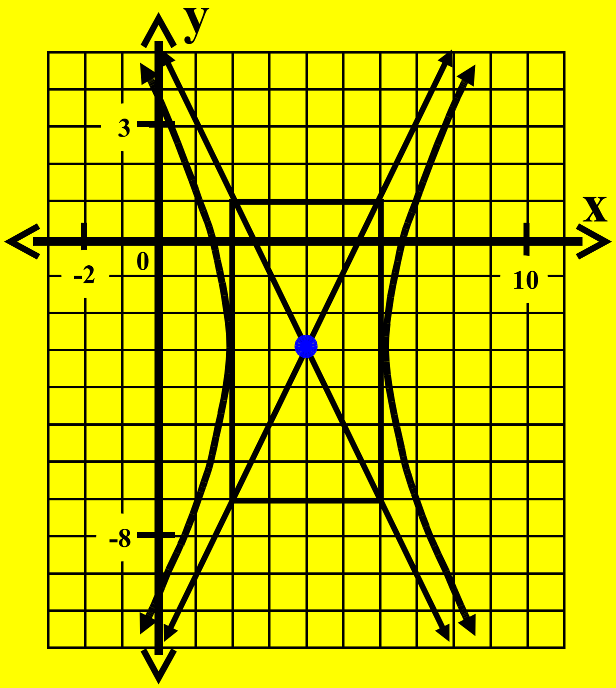

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The center of this hyperbola is (4, -3).

F_1 is c units left of the center.

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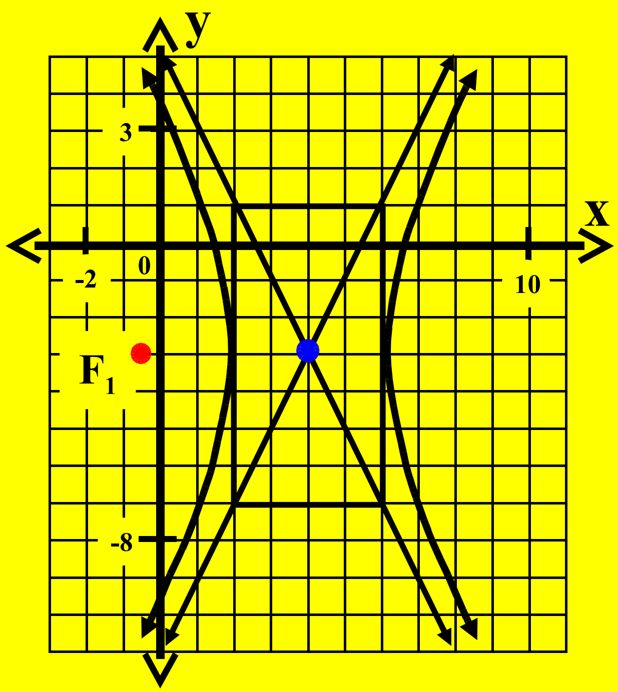

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The center of this hyperbola is (4, -3).

F_1 is c units left of the center.

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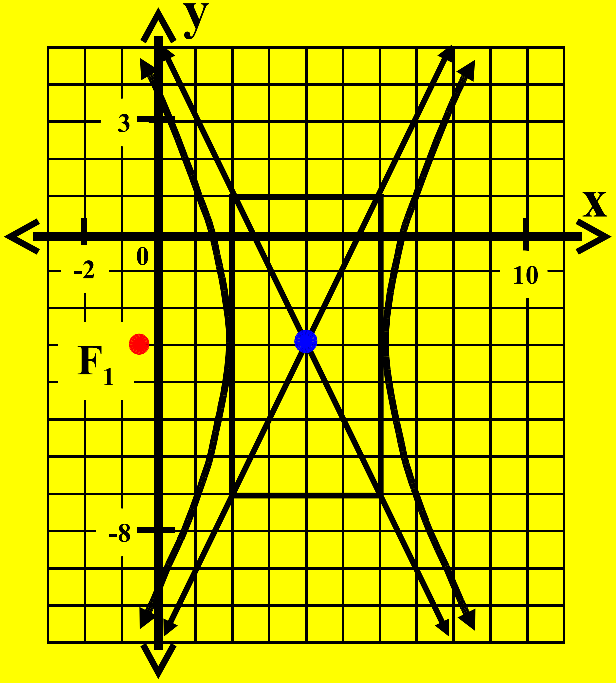

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The center of this hyperbola is (4, -3).

F_1 is c units left of the center.

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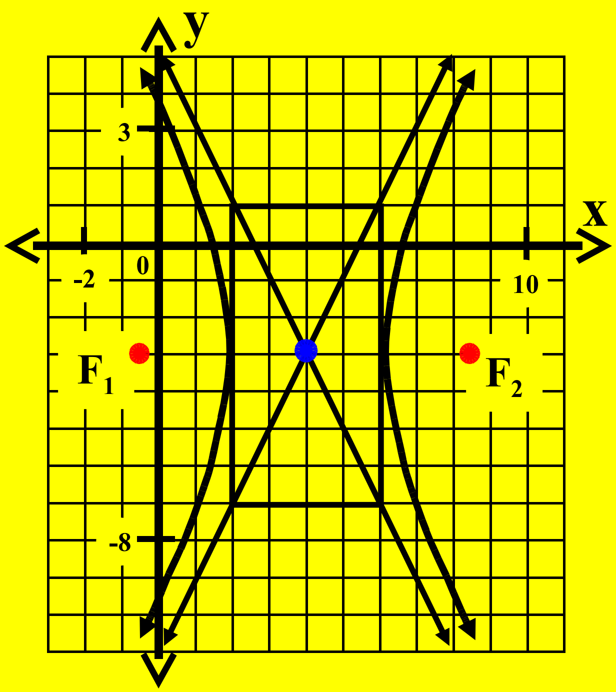

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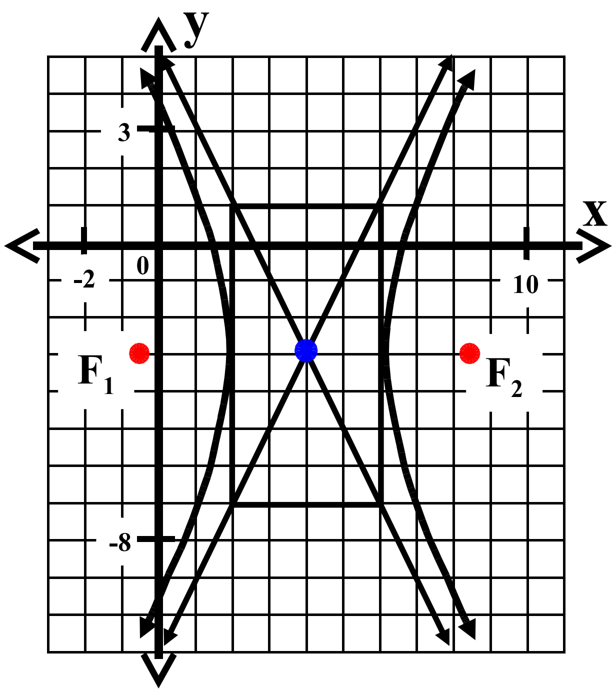

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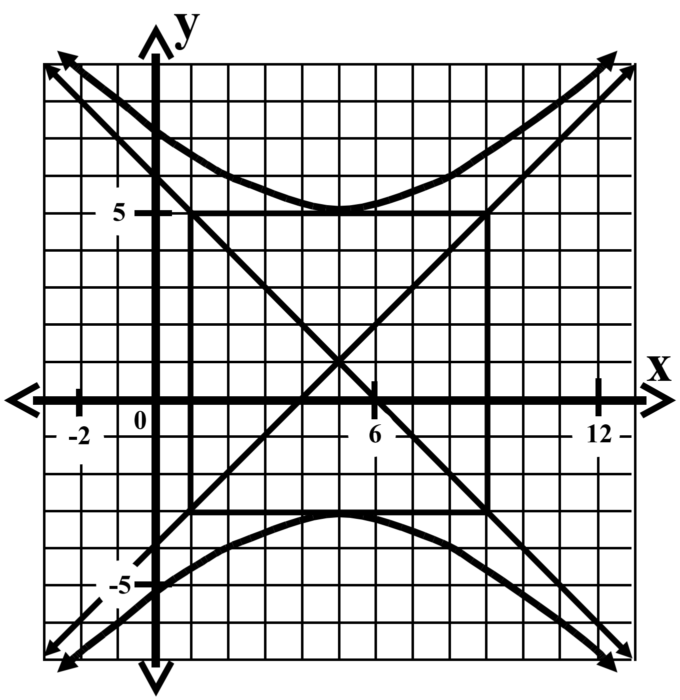

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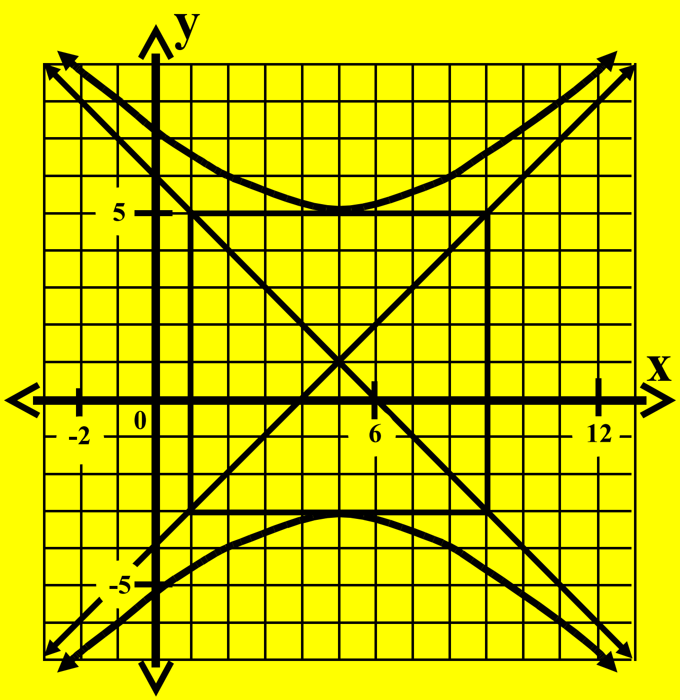
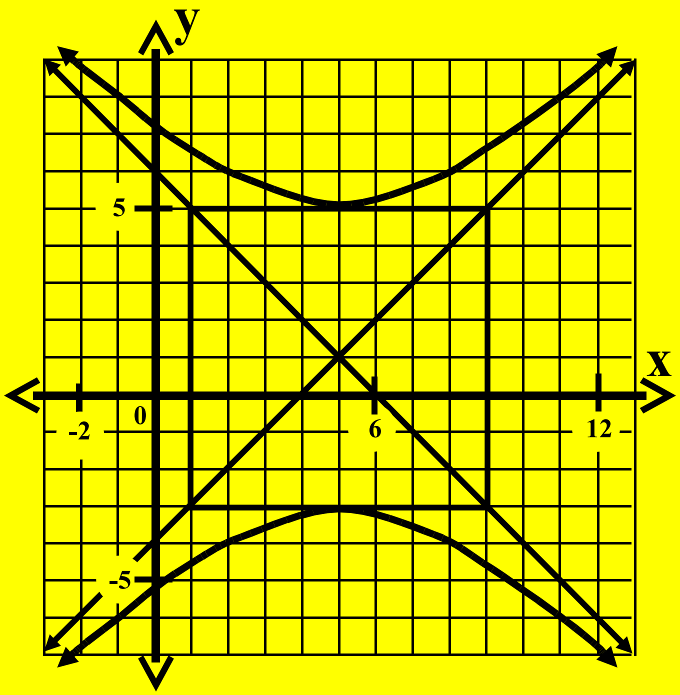


Class Worksheet #3

Write the equation in standard form and the equation in general form for each hyperbola. Then locate and label the foci F_1 and F_2.

This a type 2 Hyperbola.

2.



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Write the equation in standard form and the equation in general form for each hyperbola. Then locate and label the foci F_1 and F_2.

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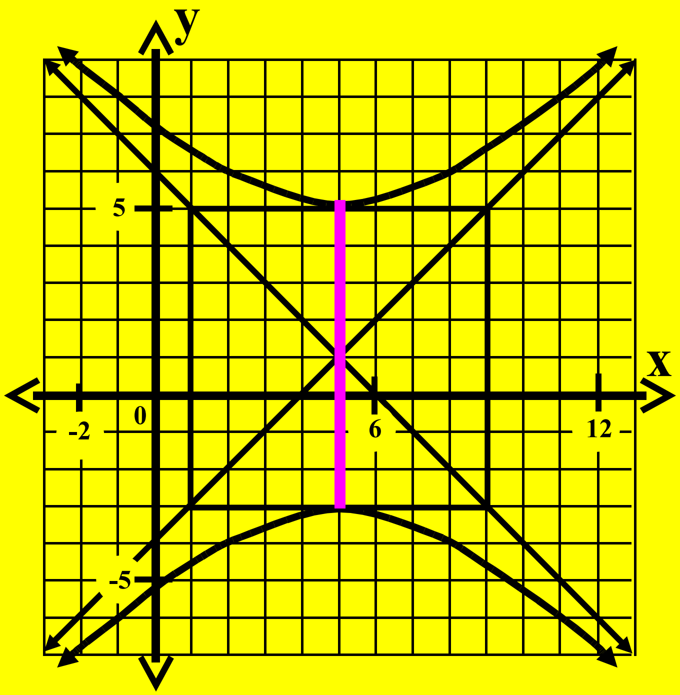

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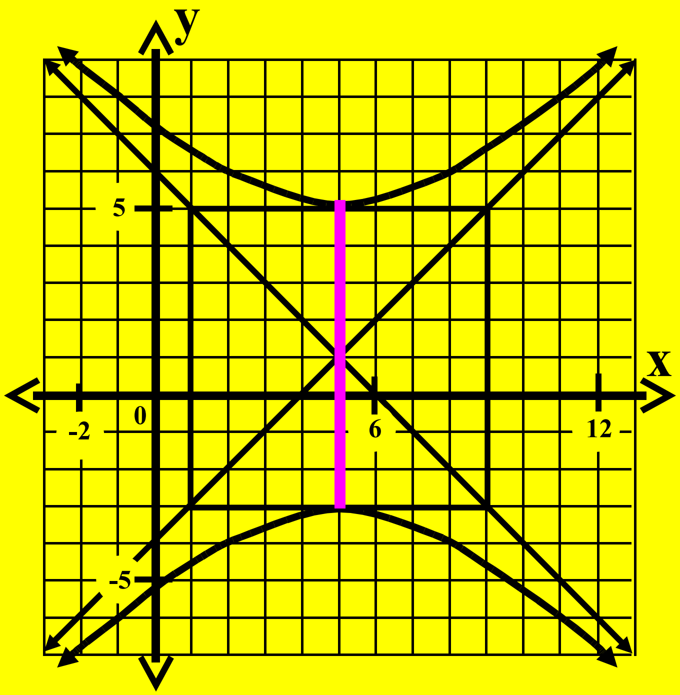

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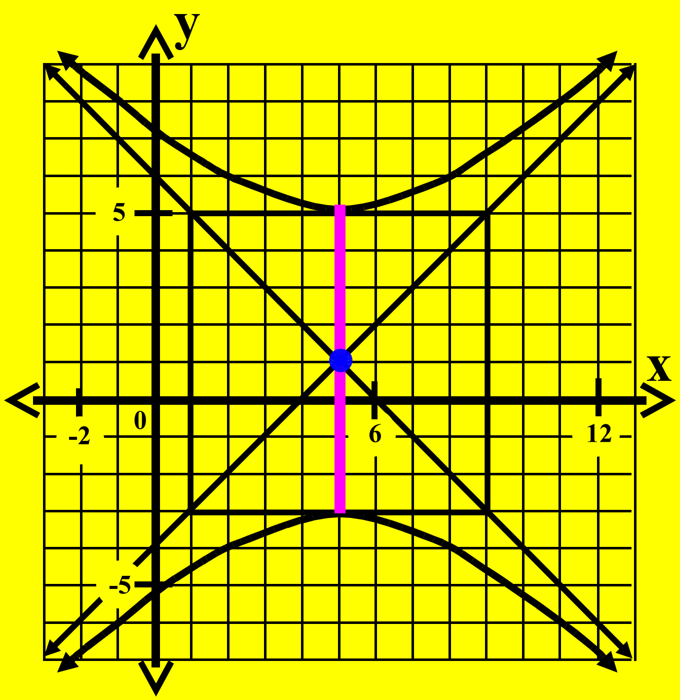

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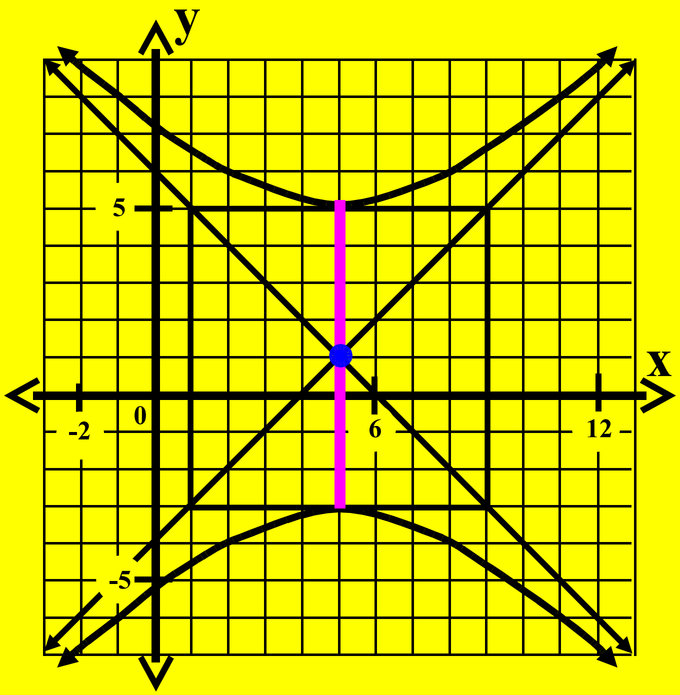

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h = 5

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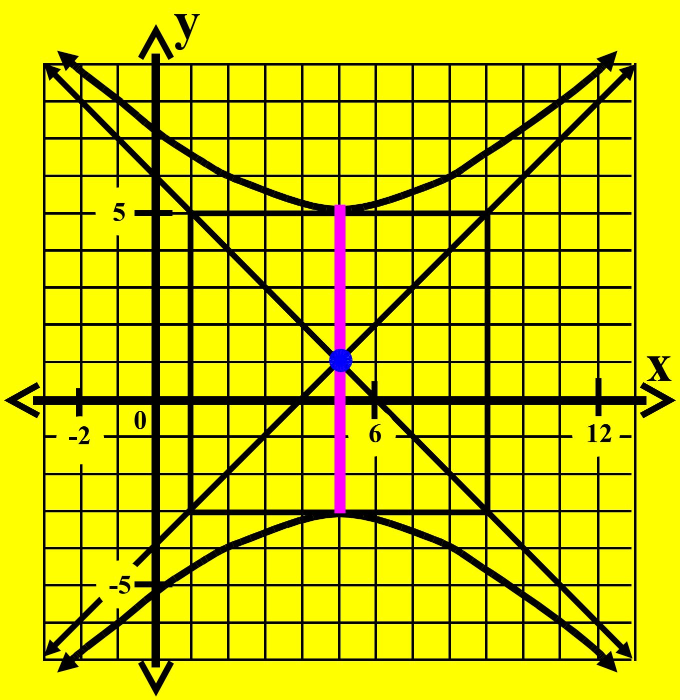

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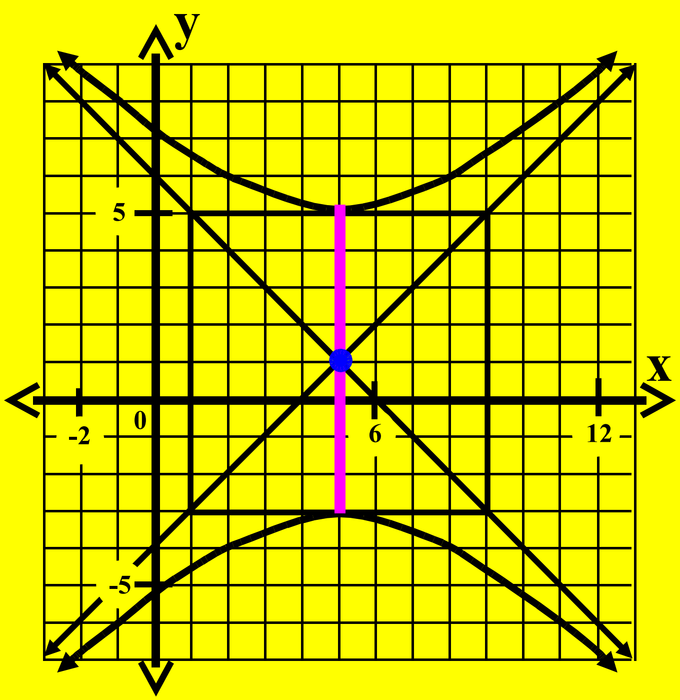

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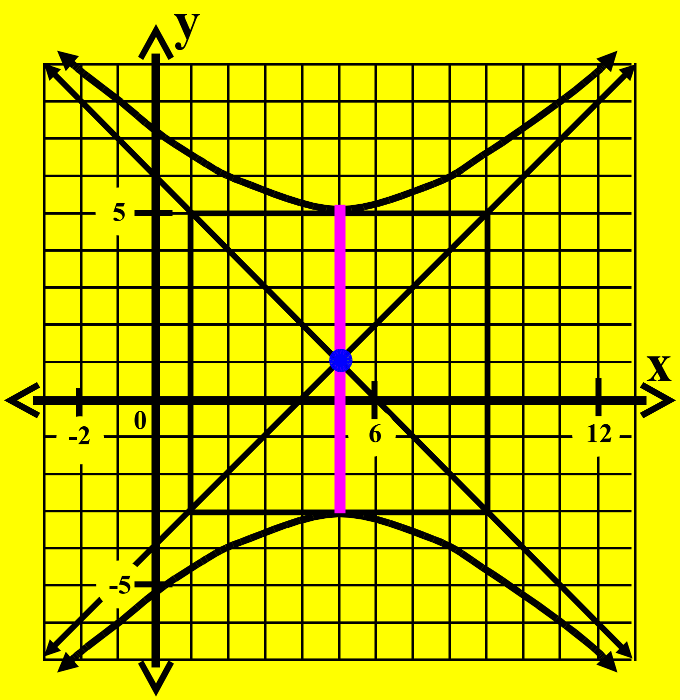

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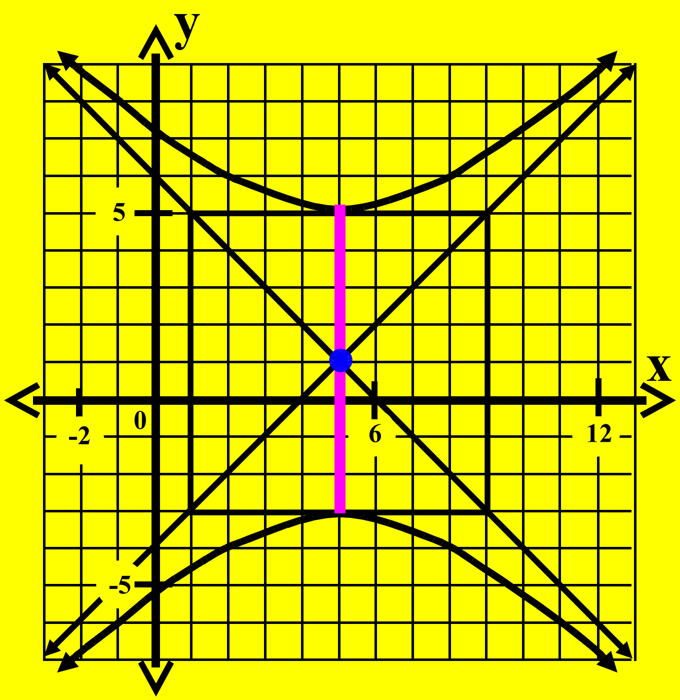

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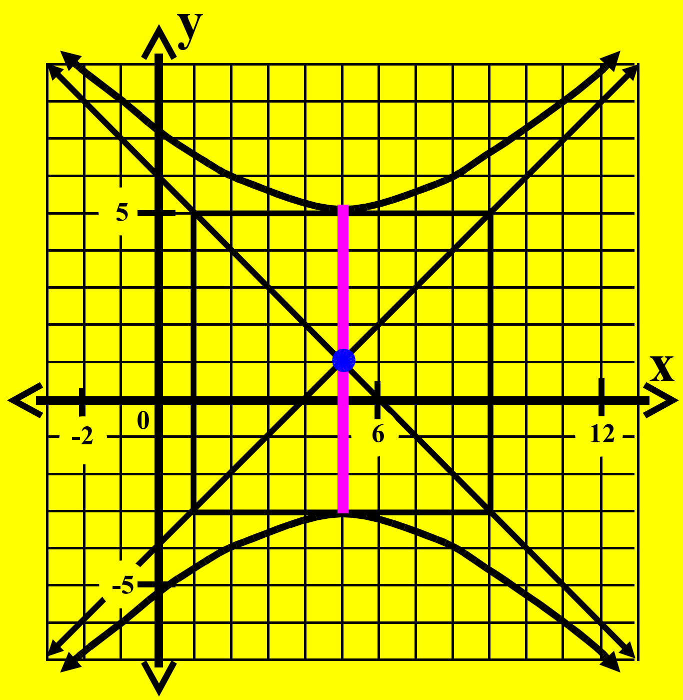

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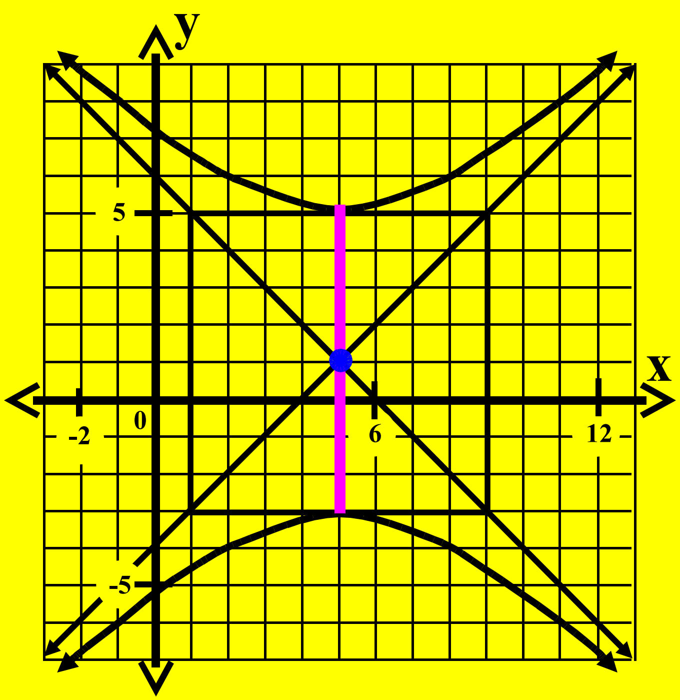

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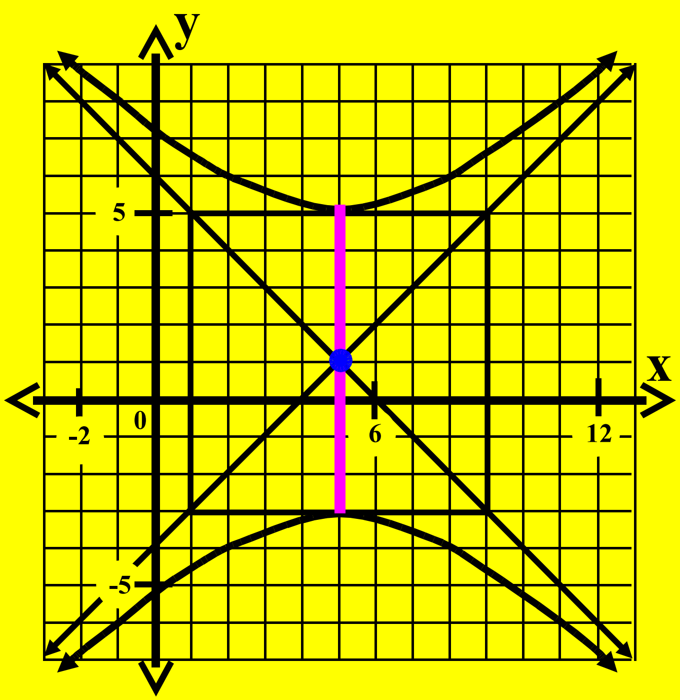

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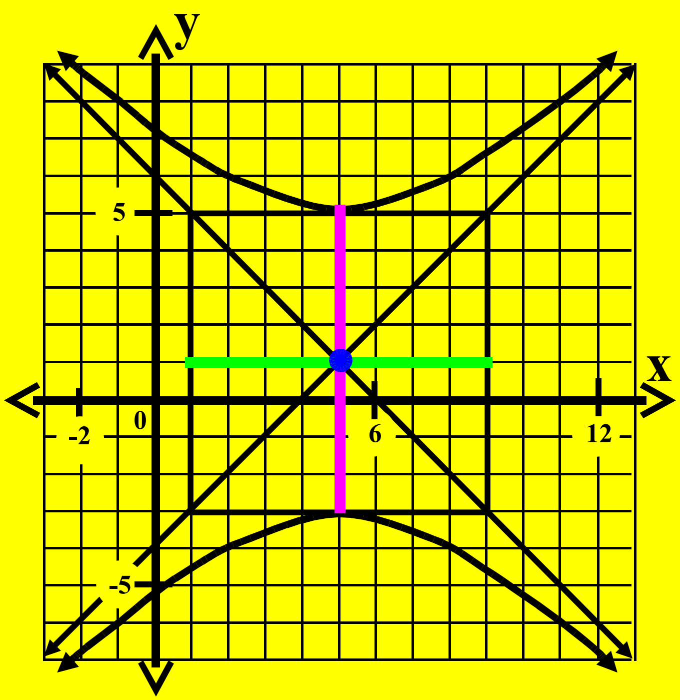

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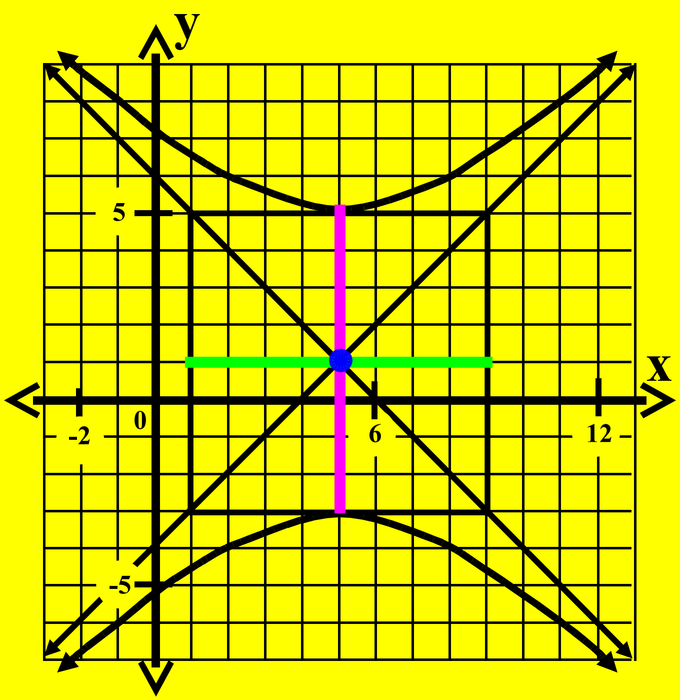

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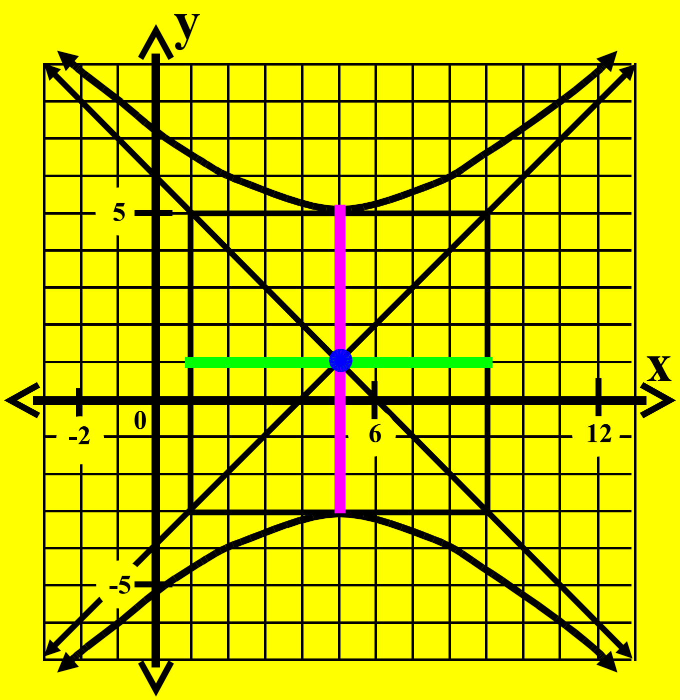

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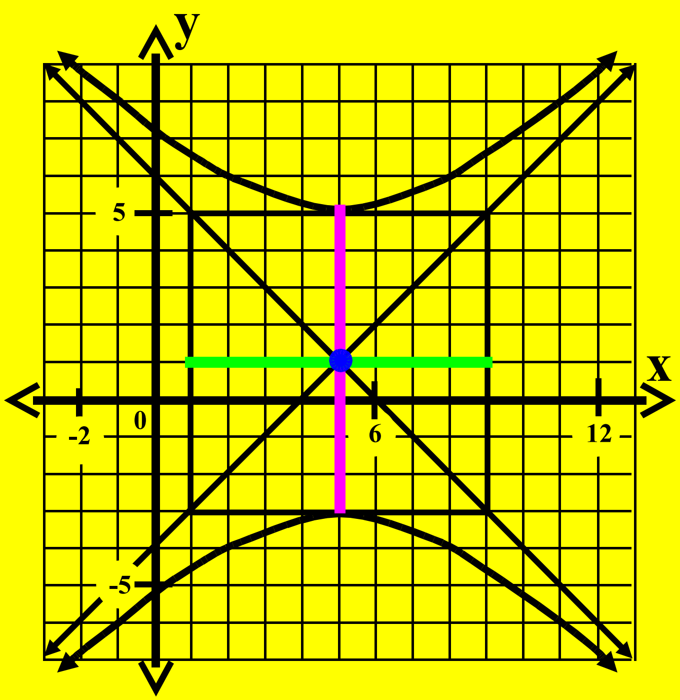

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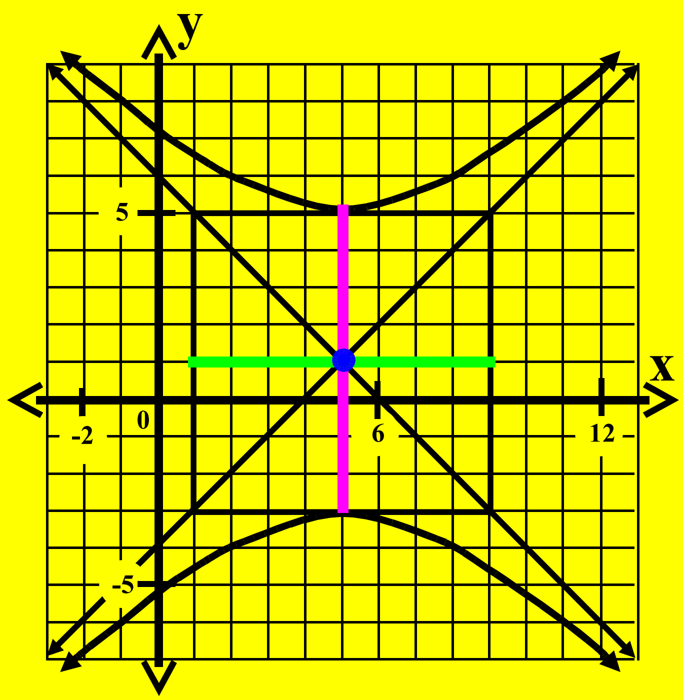

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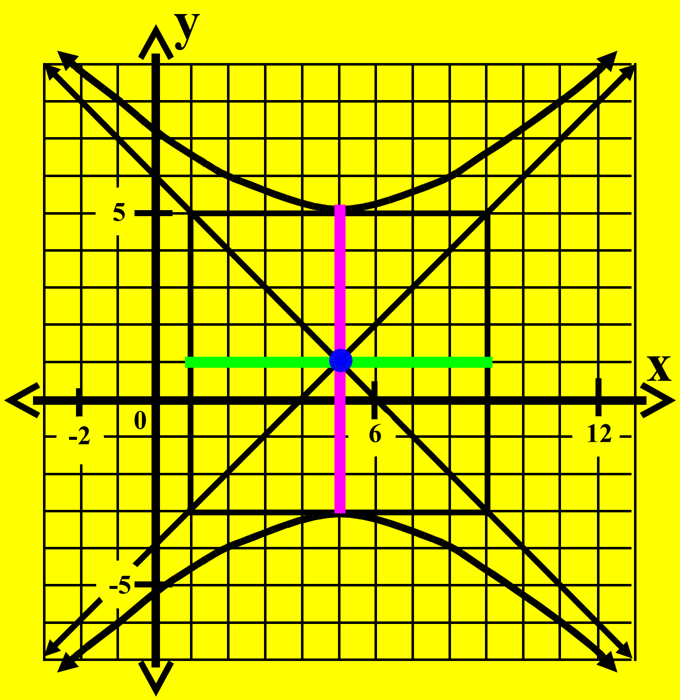

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$\underline{(y-1)^2}$

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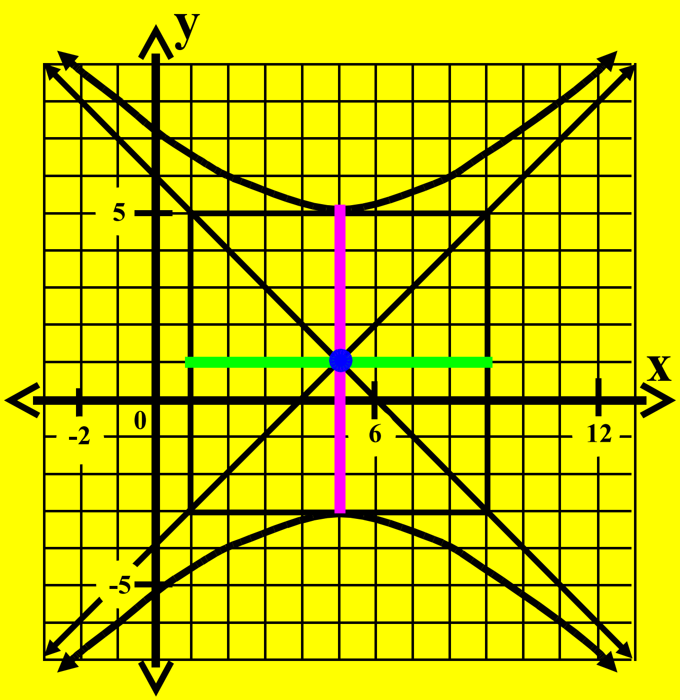

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$$\frac{(y-1)^2}{4^2}$$

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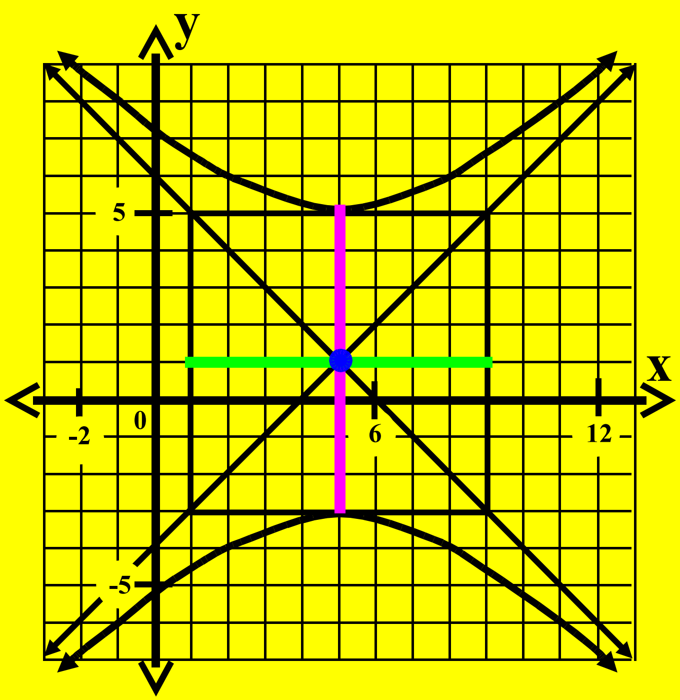

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$$\frac{(y-1)^2}{4^2} -$$

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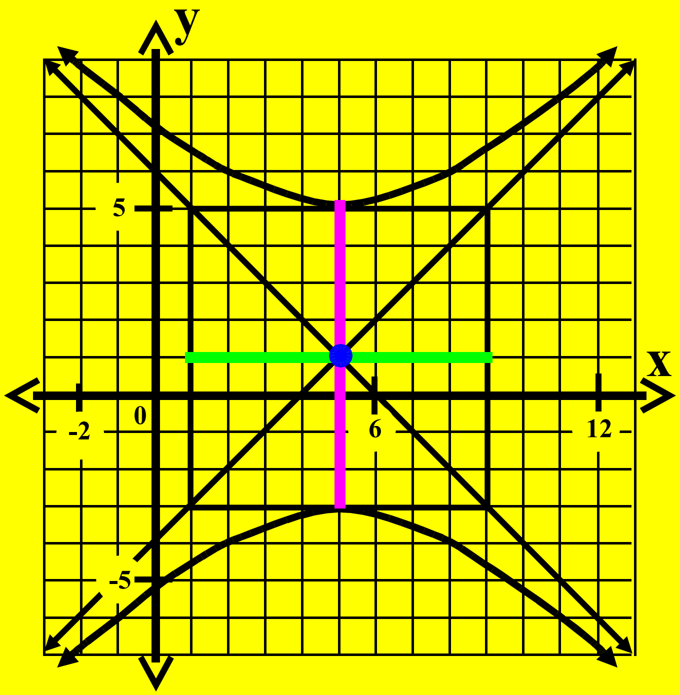

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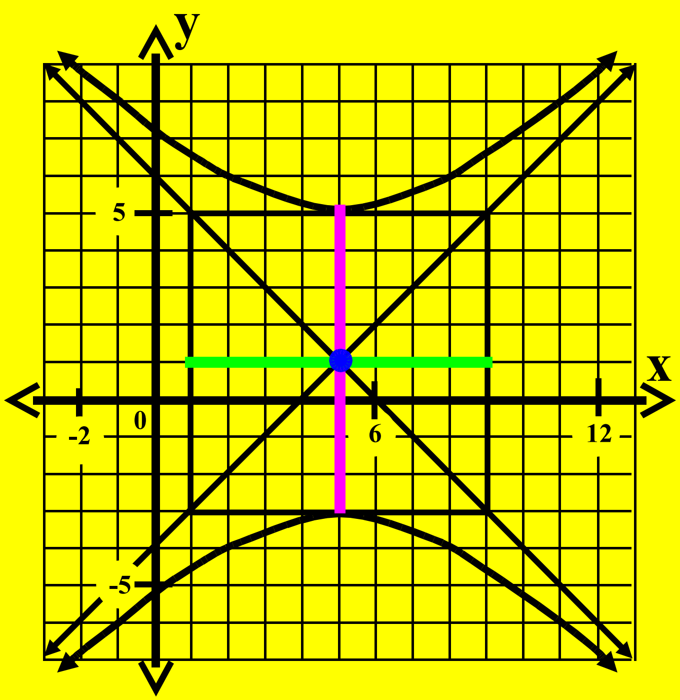

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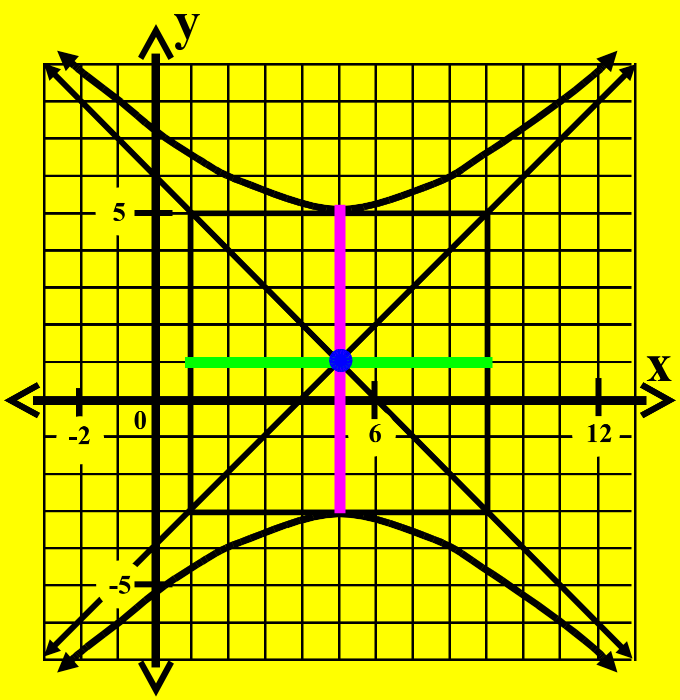

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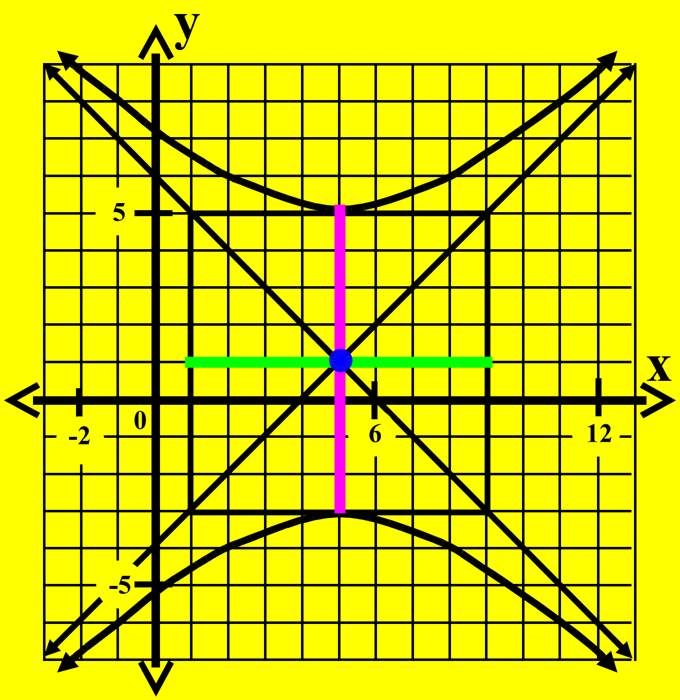

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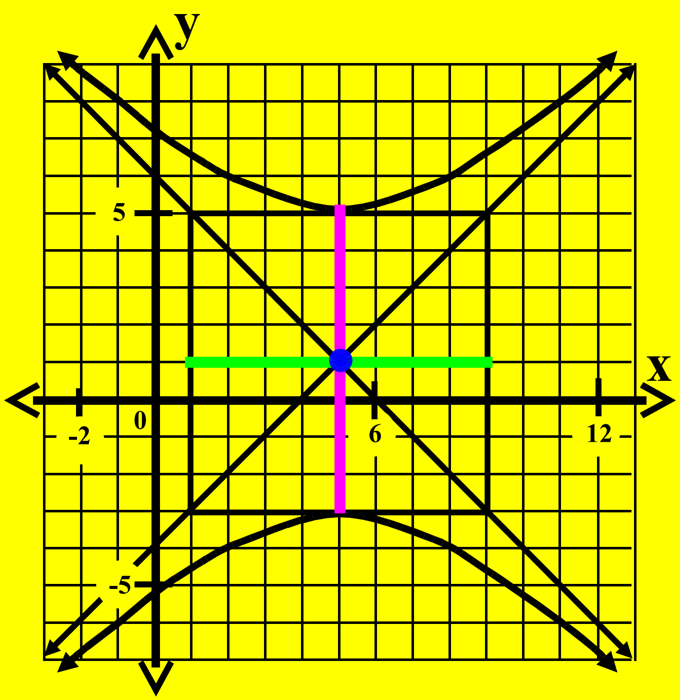

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The transverse axis is 8 units long.

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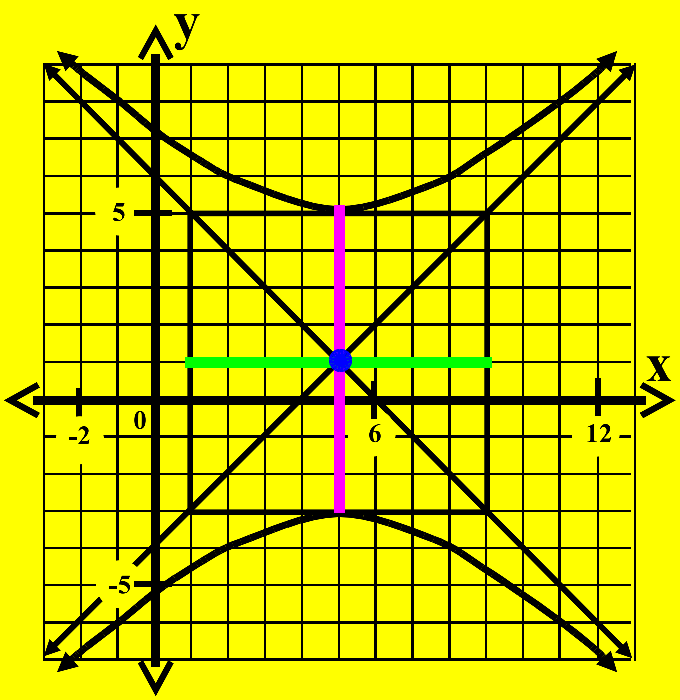

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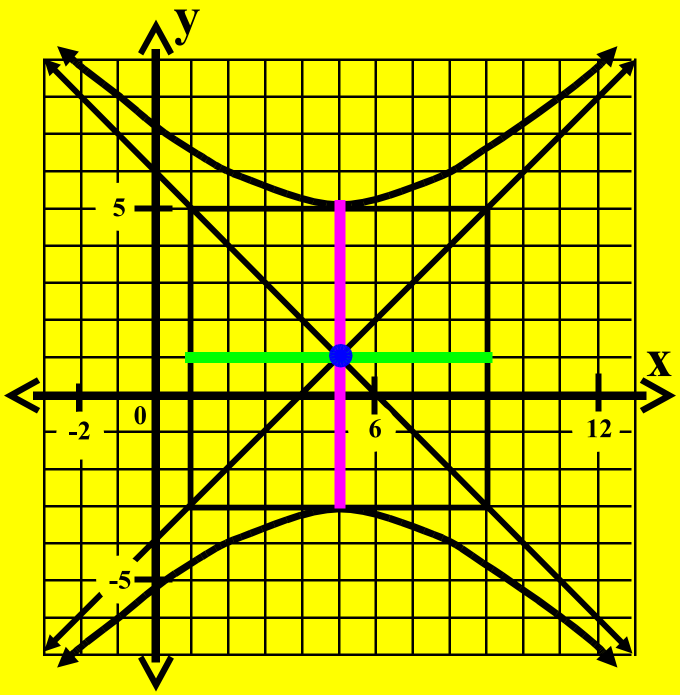

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$$\frac{(y-1)^2}{4^2} - \frac{(x-5)^2}{4^2} = 1 \Rightarrow \frac{(y-1)^2}{16}$$

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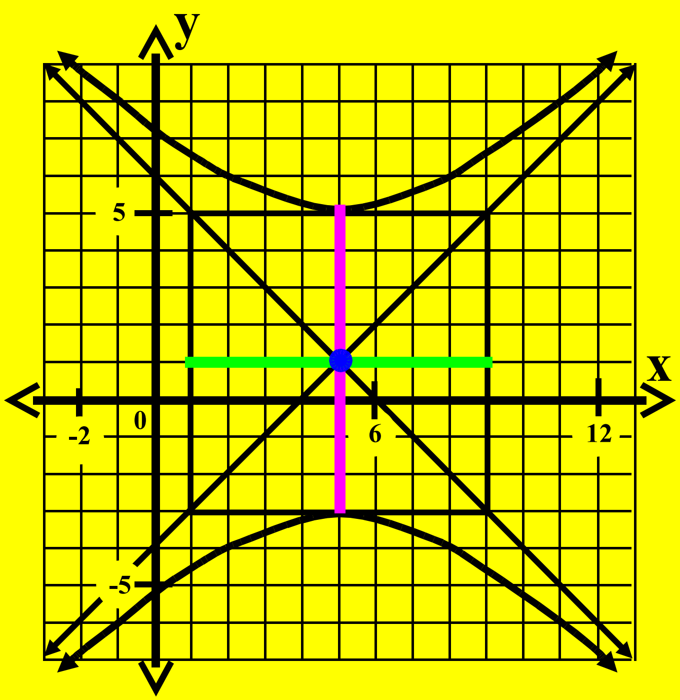

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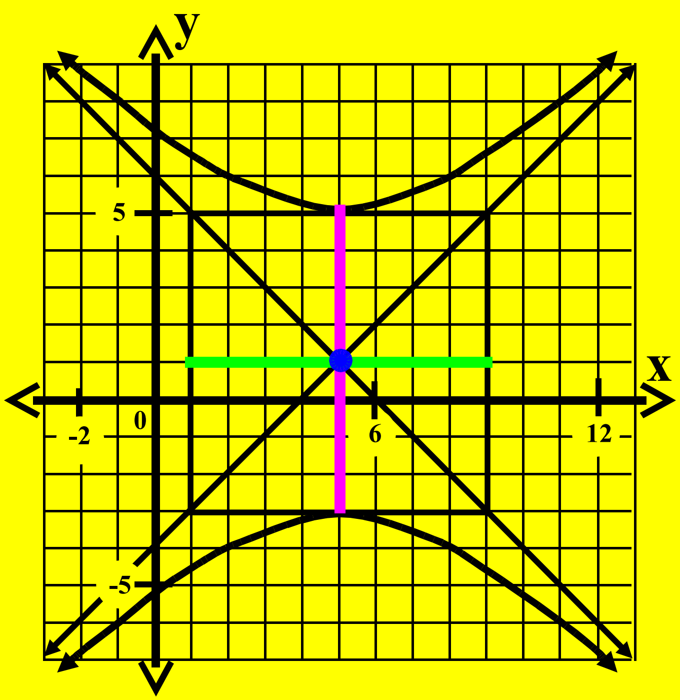

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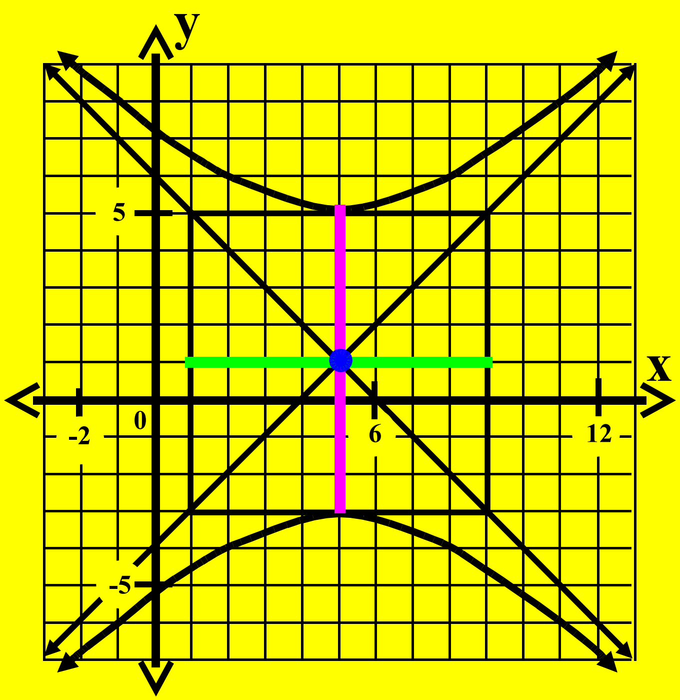

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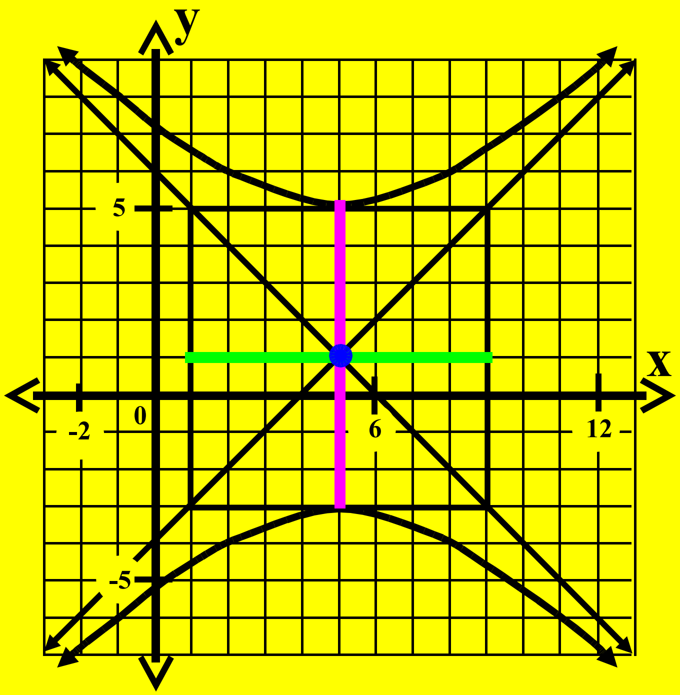

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$2a = 8 \Rightarrow a = 4$

The conjugate axis is 8 units long.

$2b = 8 \Rightarrow b = 4$

$$\frac{(y-1)^2}{4^2} - \frac{(x-5)^2}{4^2} = 1 \Rightarrow \frac{(y-1)^2}{16} - \frac{(x-5)^2}{16} =$$

Standard Form Equation

Class Worksheet #3

Write the equation in standard form and the equation in general form for each hyperbola. Then locate and label the foci F_1 and F_2.

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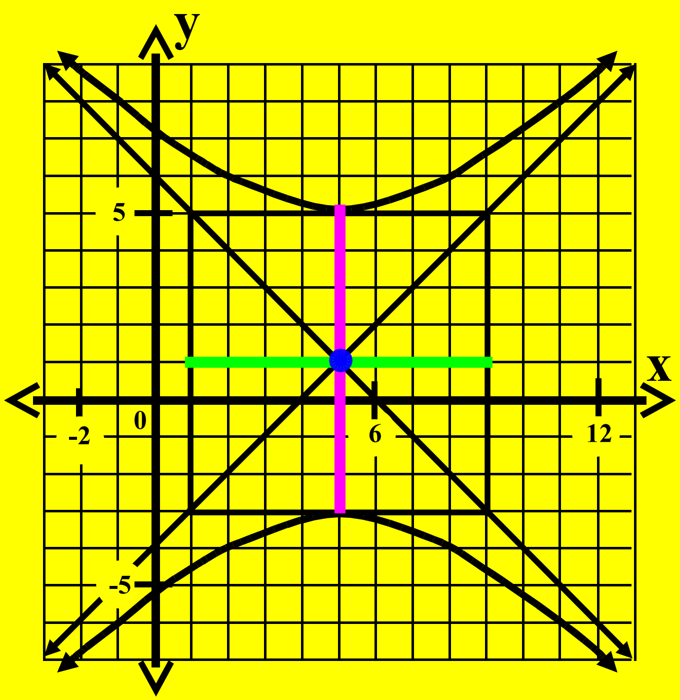

This a type 2 Hyperbola.
(The transverse axis is vertical.)

Standard Form Equation

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

The center is the point (5, 1).

$h = 5$ and $k = 1$

The transverse axis is 8 units long.

$2a = 8 \Rightarrow a = 4$

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$2b = 8 \Rightarrow b = 4$

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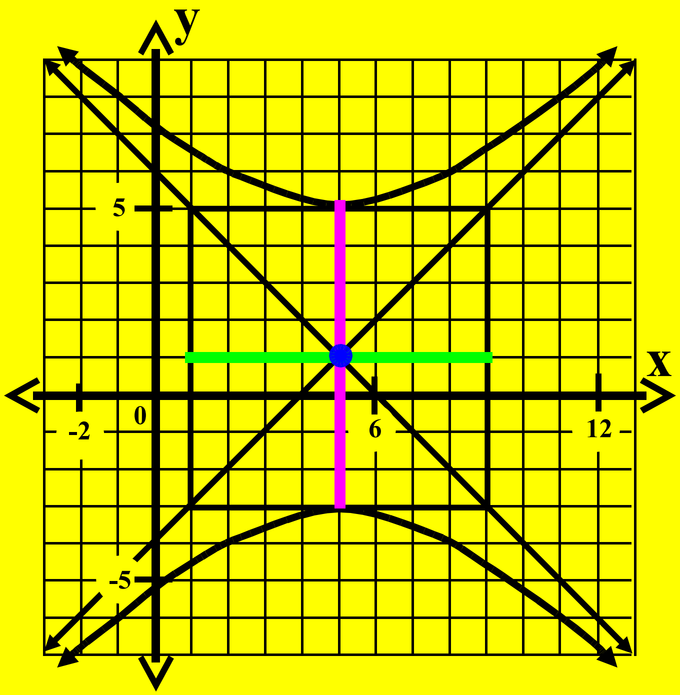

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Standard Form Equation

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The center is the point (5, 1).

$h = 5$ and $k = 1$

The transverse axis is 8 units long.

$2a = 8 \Rightarrow a = 4$

The conjugate axis is 8 units long.

$2b = 8 \Rightarrow b = 4$

$$\frac{(y-1)^2}{4^2} - \frac{(x-5)^2}{4^2} = 1 \Rightarrow \frac{(y-1)^2}{16} - \frac{(x-5)^2}{16} = 1$$

Standard Form Equation

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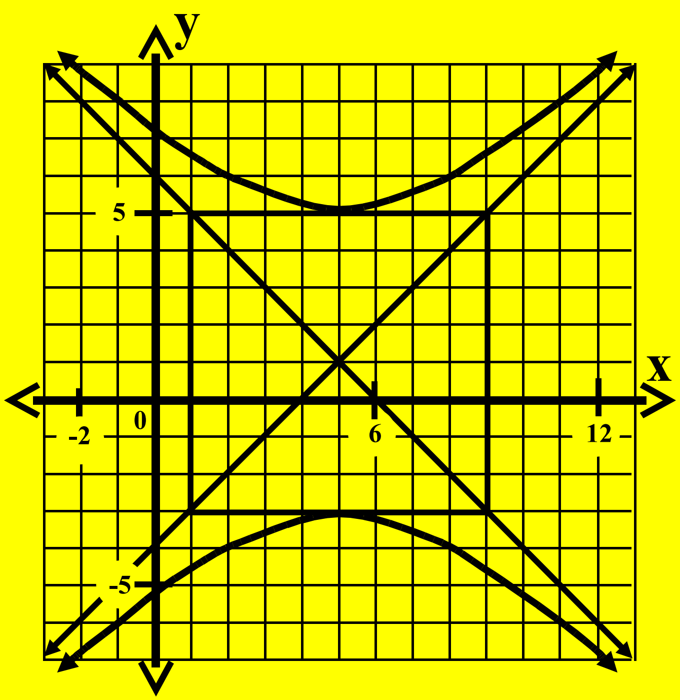

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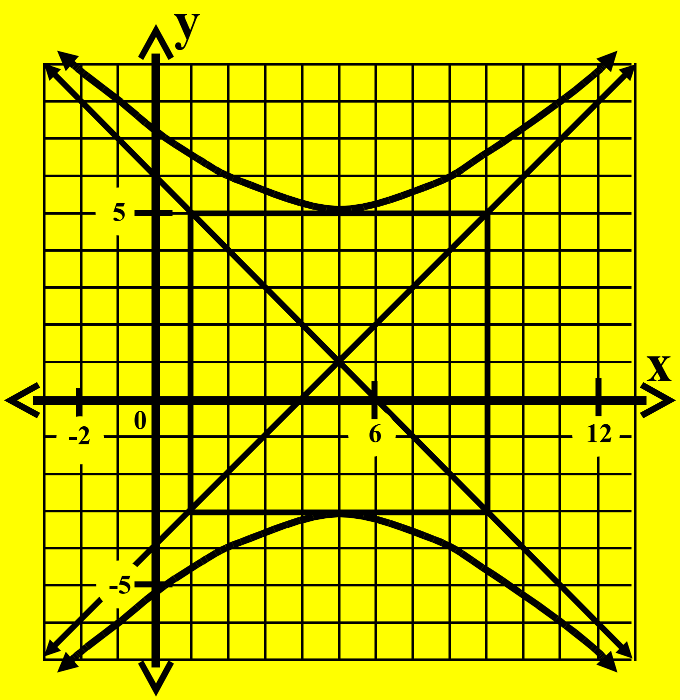

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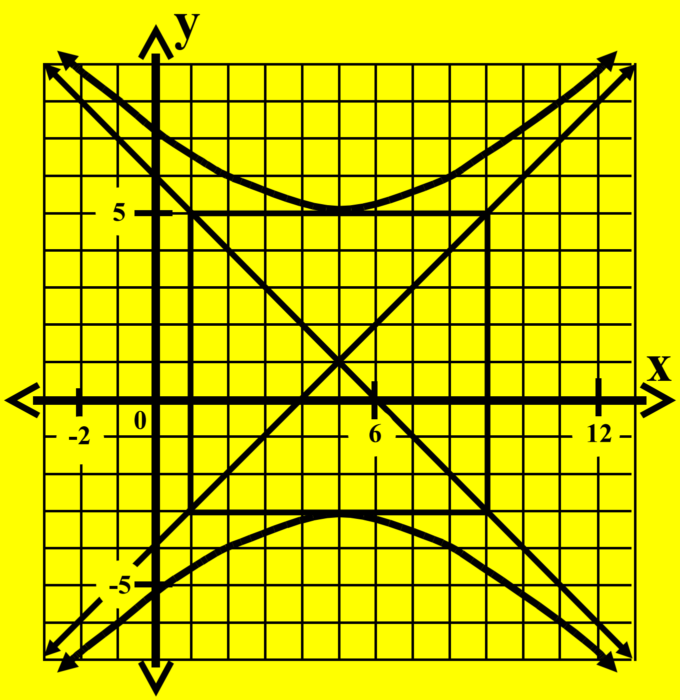

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Standard Form Equation

$$\frac{(y-1)^2}{16} - \frac{(x-5)^2}{16} = 1$$

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

Class Worksheet #3

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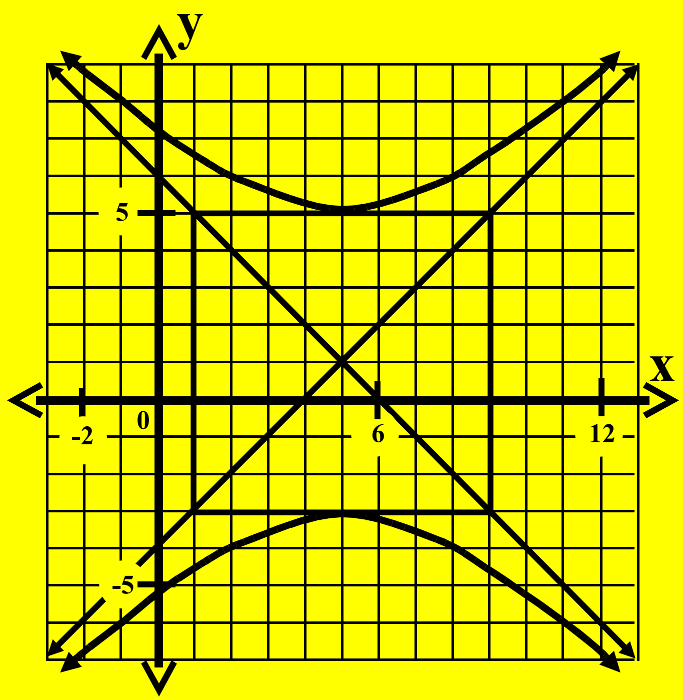

This a type 2 Hyperbola.
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Standard Form Equation

$$\frac{(y-1)^2}{16} - \frac{(x-5)^2}{16} = 1$$

Multiply both sides by 16.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

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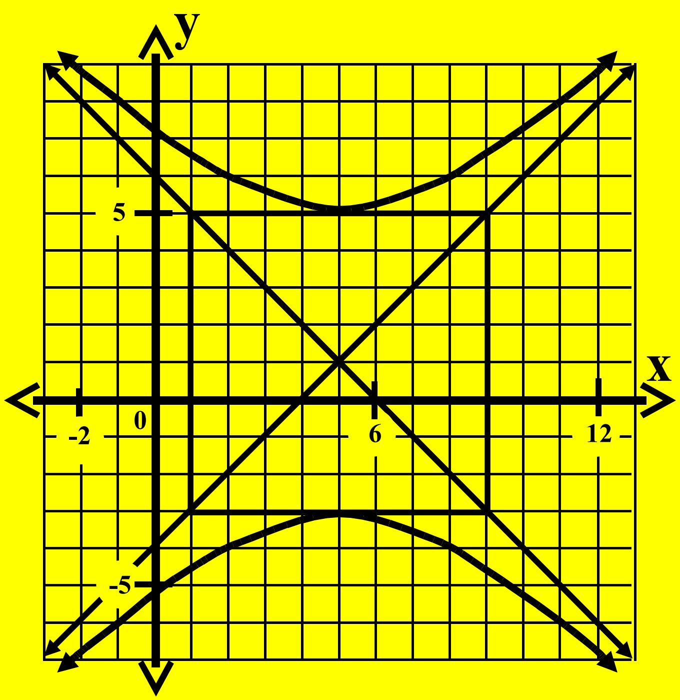

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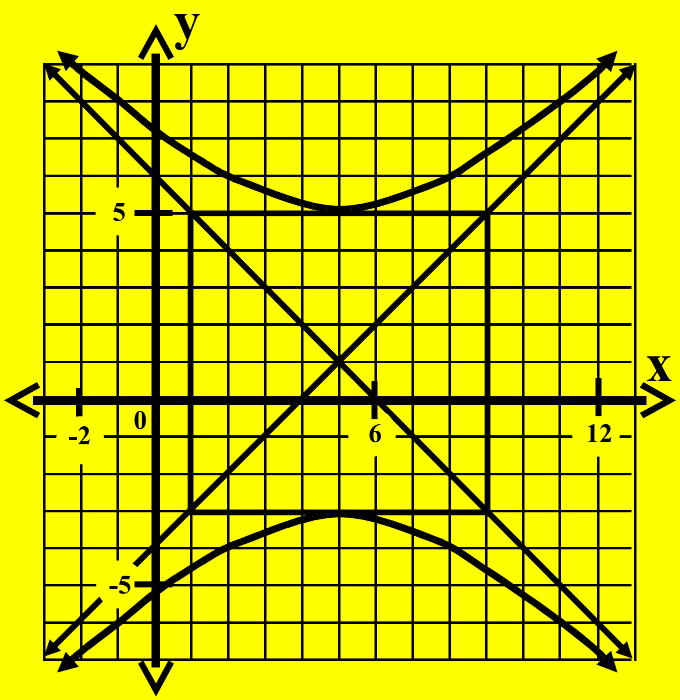

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Standard Form Equation

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$1(y-1)^2$

Multiply both sides by 16.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

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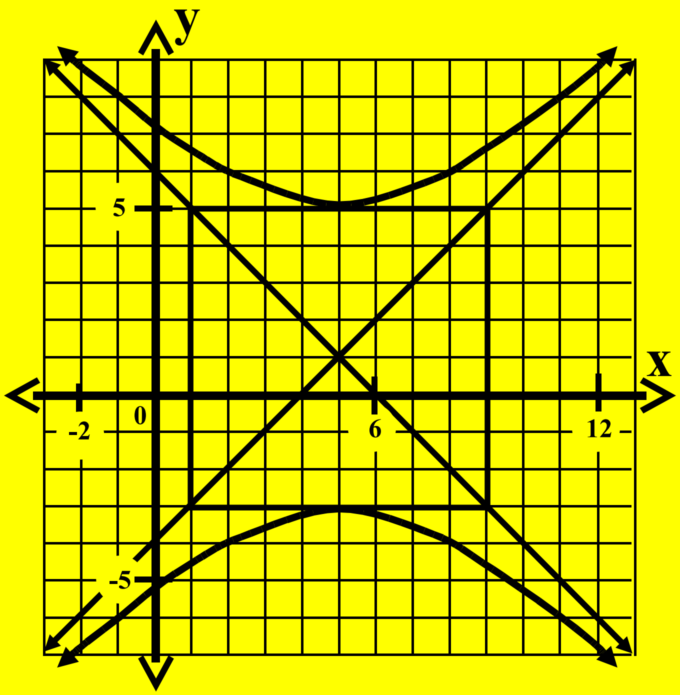

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Multiply both sides by 16.

General Form Equation

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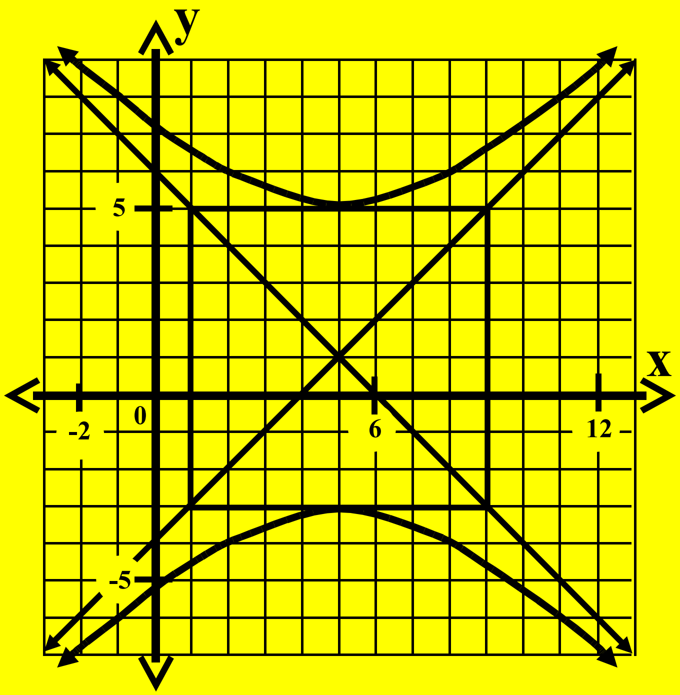

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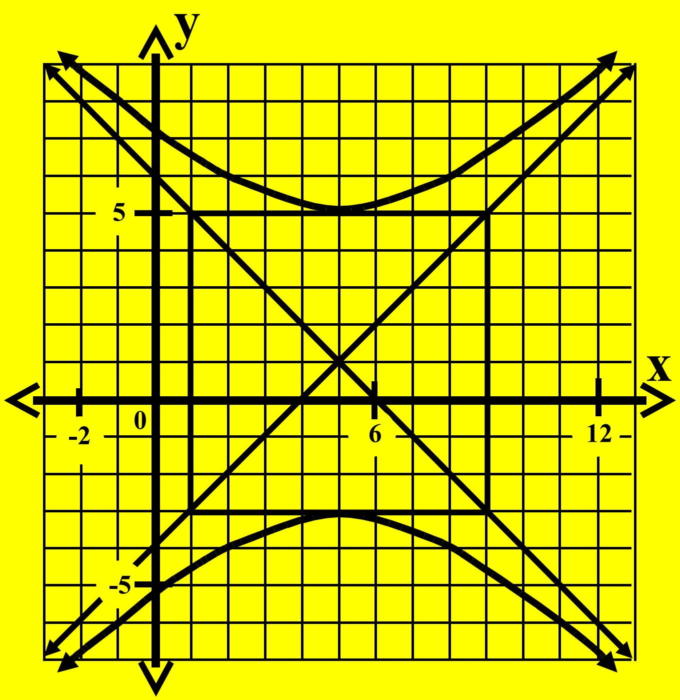

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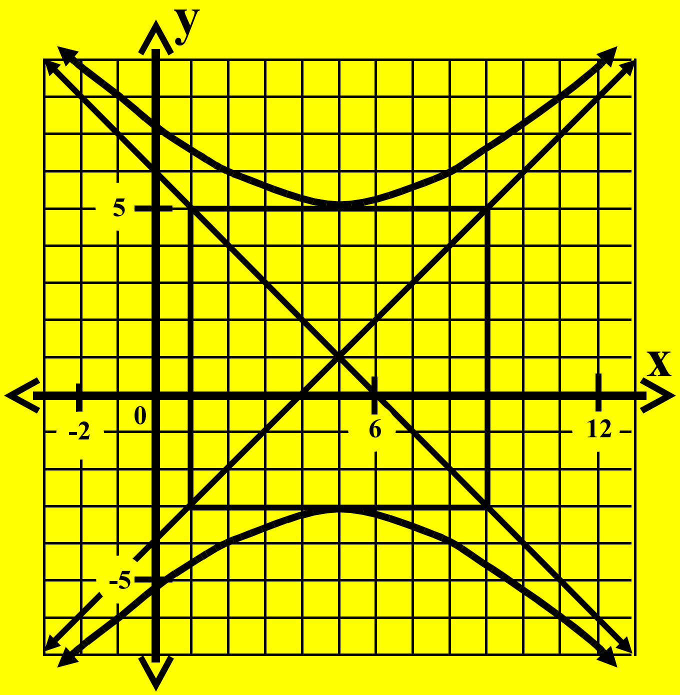

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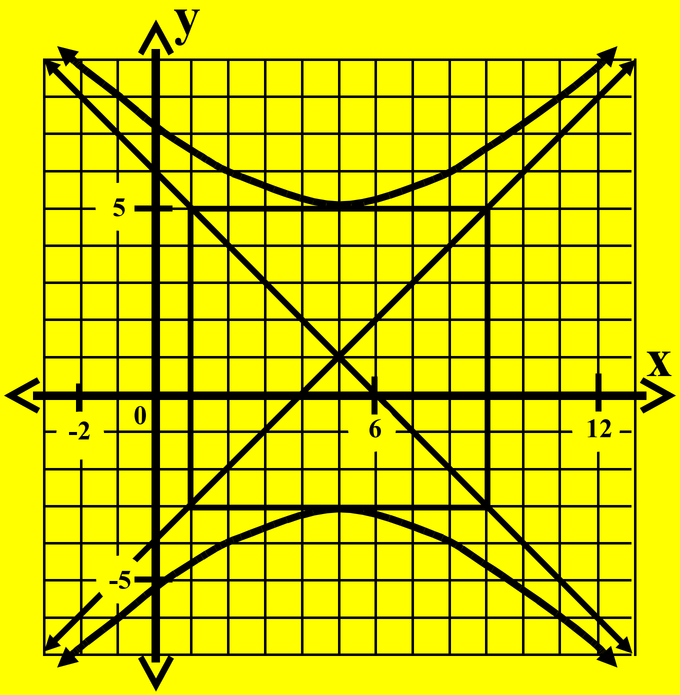

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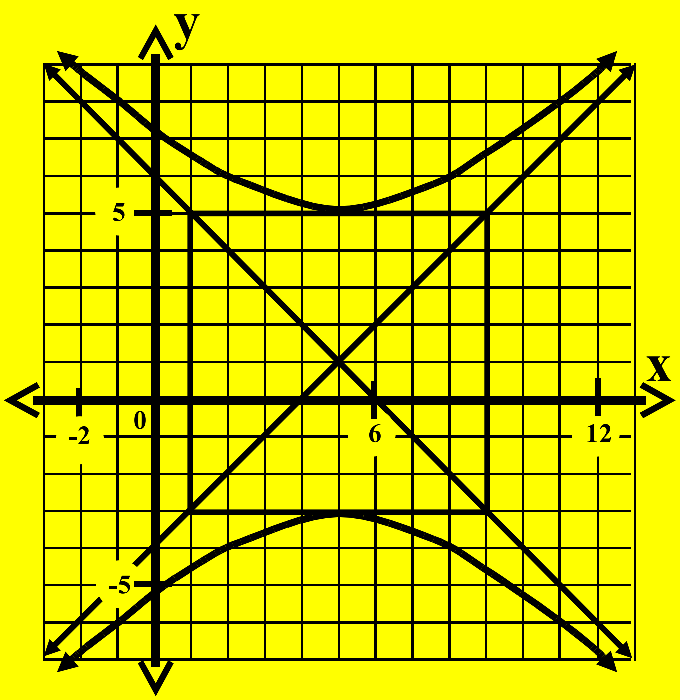

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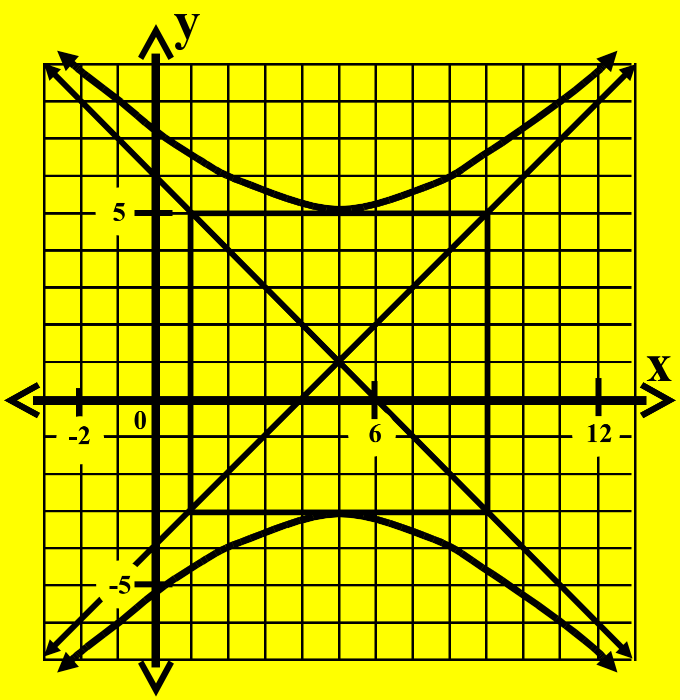

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Standard Form Equation

$$\frac{(y-1)^2}{16} - \frac{(x-5)^2}{16} = 1$$

$$1(y-1)^2 - 1(x-5)^2 = 16$$

Square the binomials.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

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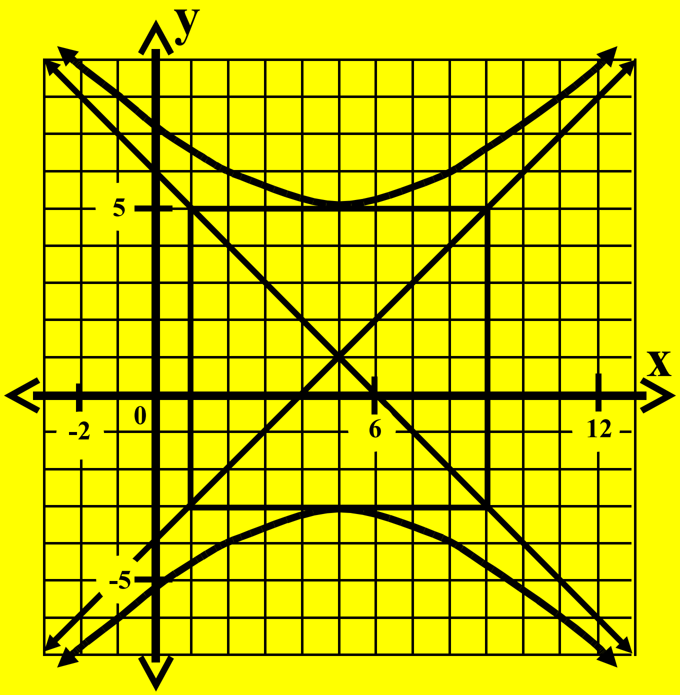

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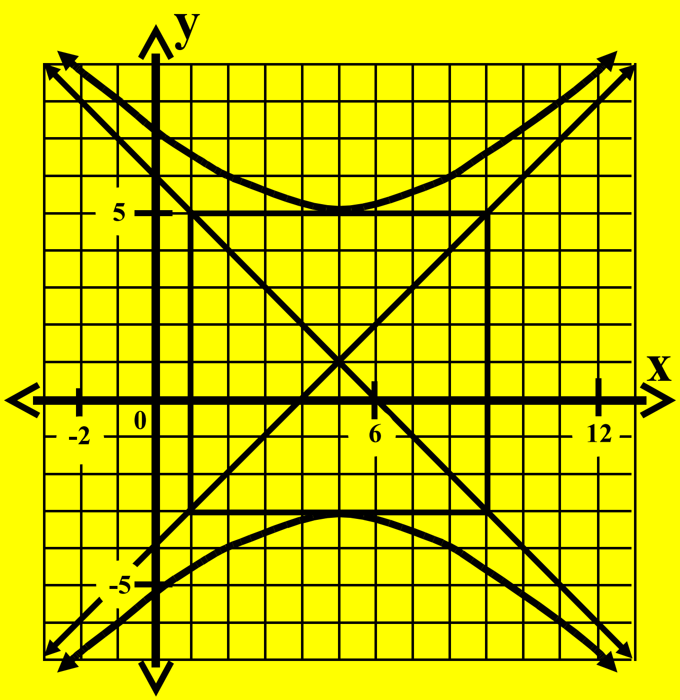

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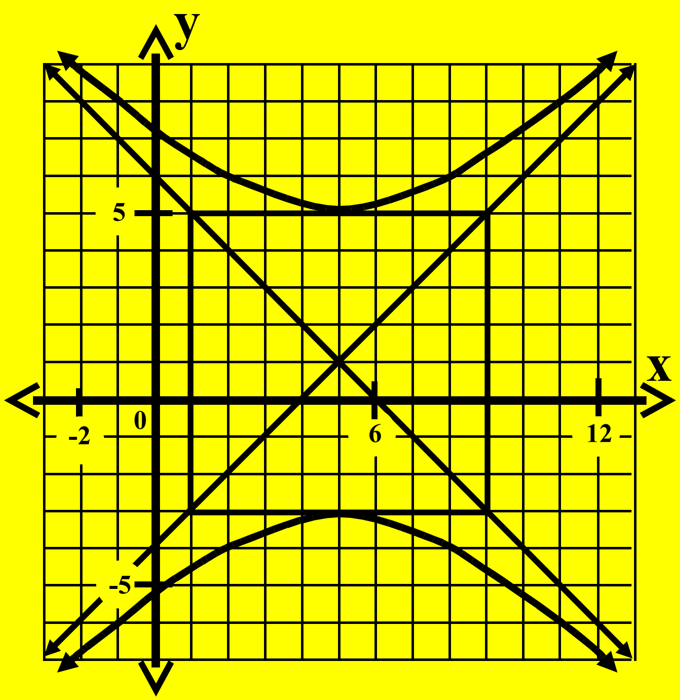

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Square the binomials.

General Form Equation

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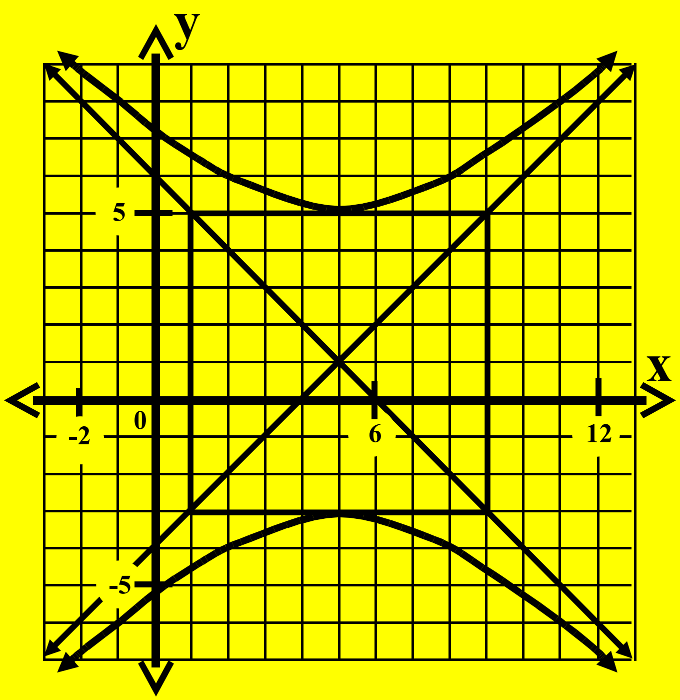

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Standard Form Equation

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$$1(y-1)^2 - 1(x-5)^2 = 16$$

$$1(y^2 - 2y$$

Square the binomials.

General Form Equation

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$$AC < 0$$

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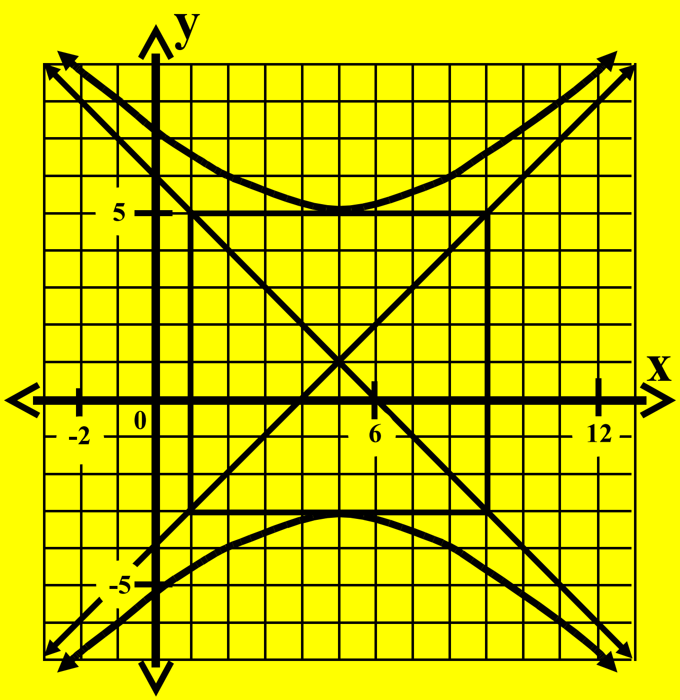

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Standard Form Equation

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$$1(y^2 - 2y + 1)$$

Square the binomials.

General Form Equation

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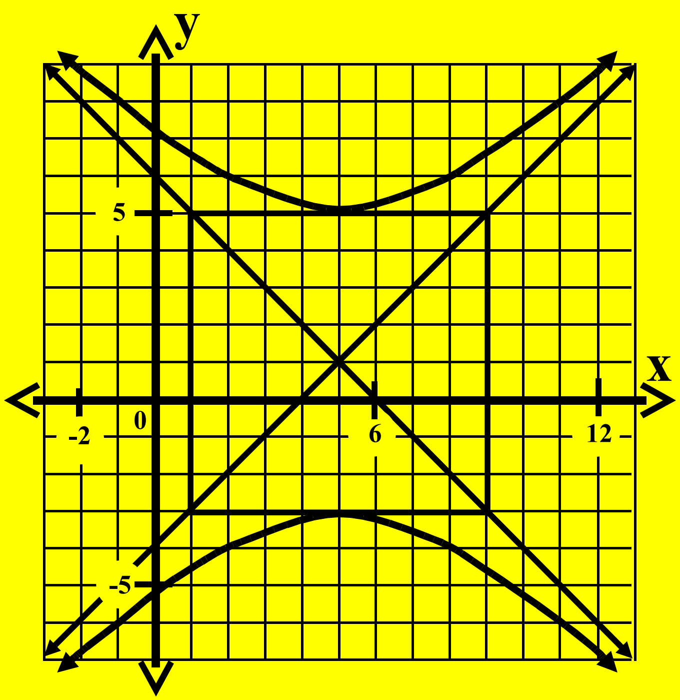

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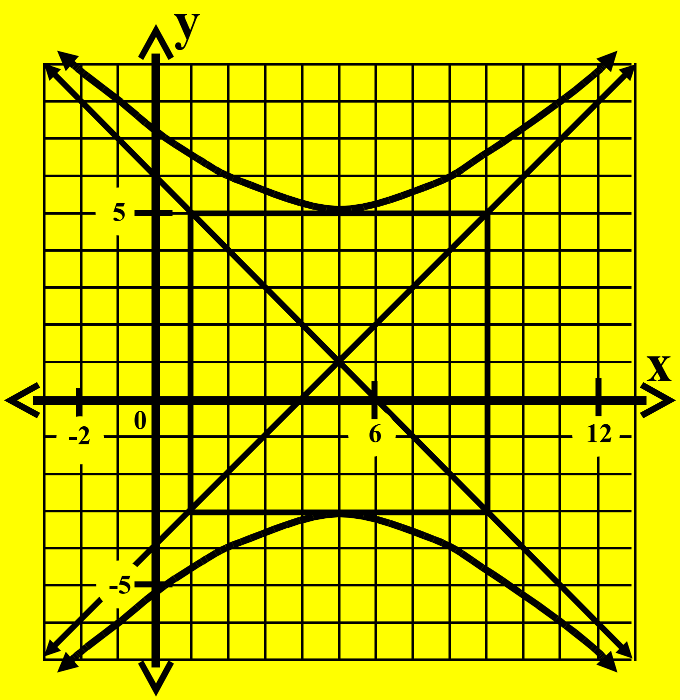

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General Form Equation

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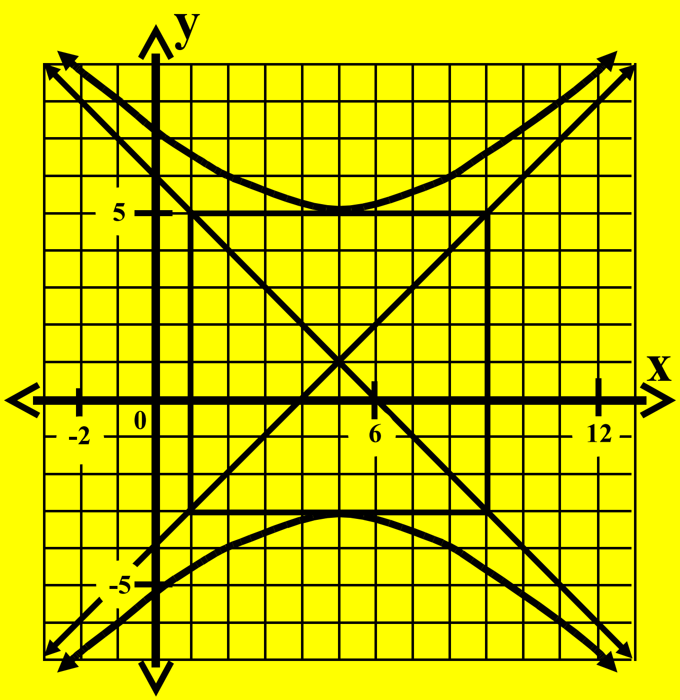

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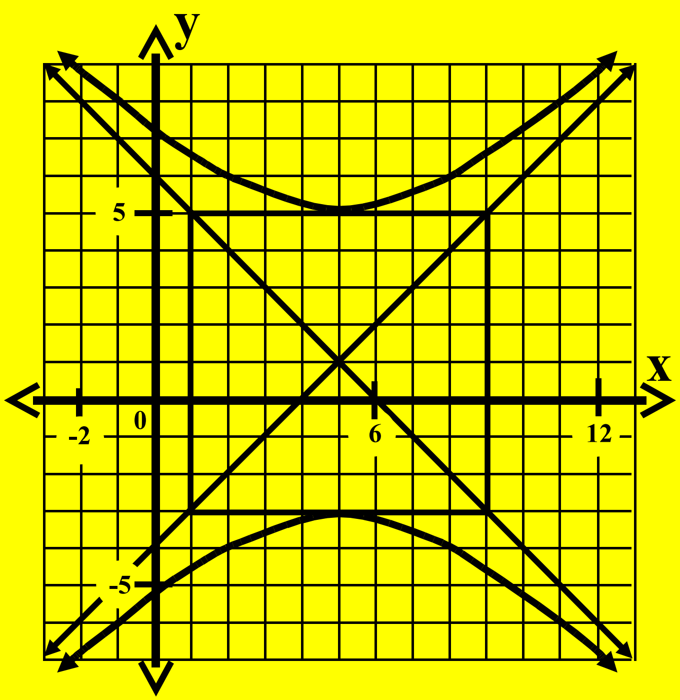

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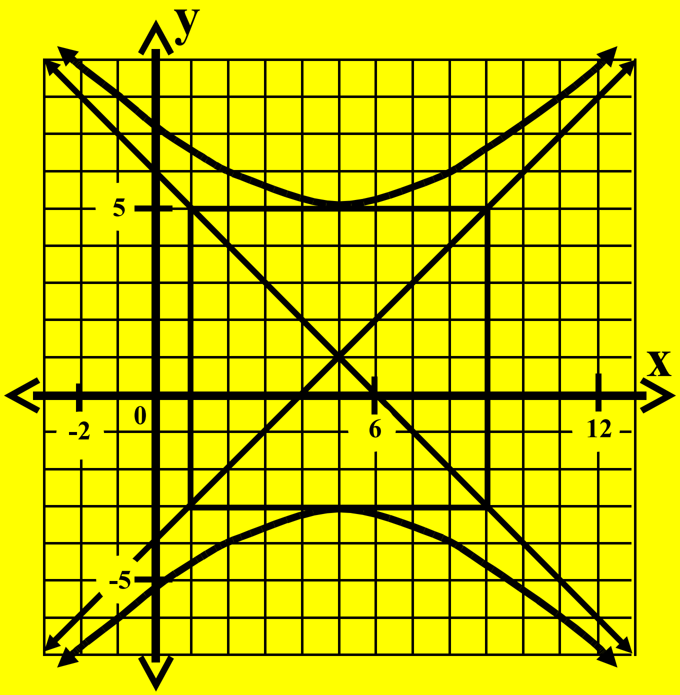

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$$1(y^2 - 2y + 1) - 1(x^2 - 10x$$

Square the binomials.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

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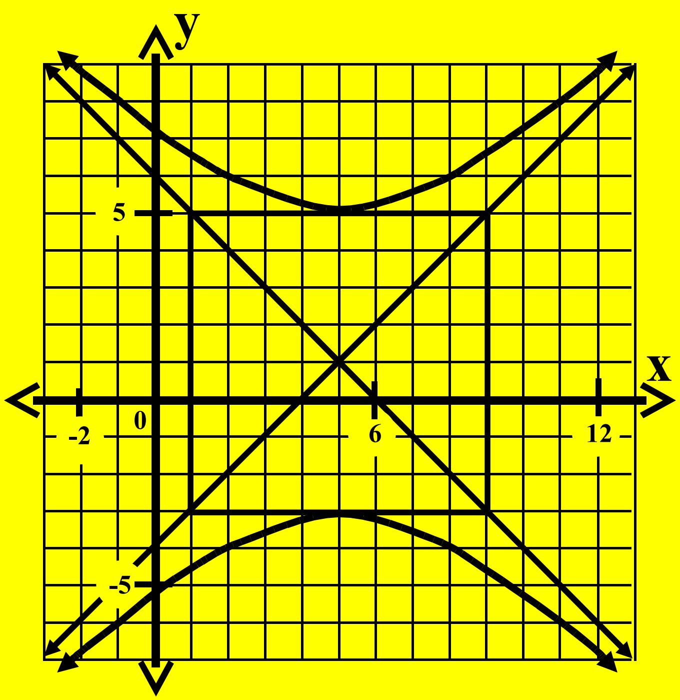

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Standard Form Equation

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$$1(y-1)^2 - 1(x-5)^2 = 16$$

$$1(y^2 - 2y + 1) - 1(x^2 - 10x + 25)$$

Square the binomials.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

Class Worksheet #3

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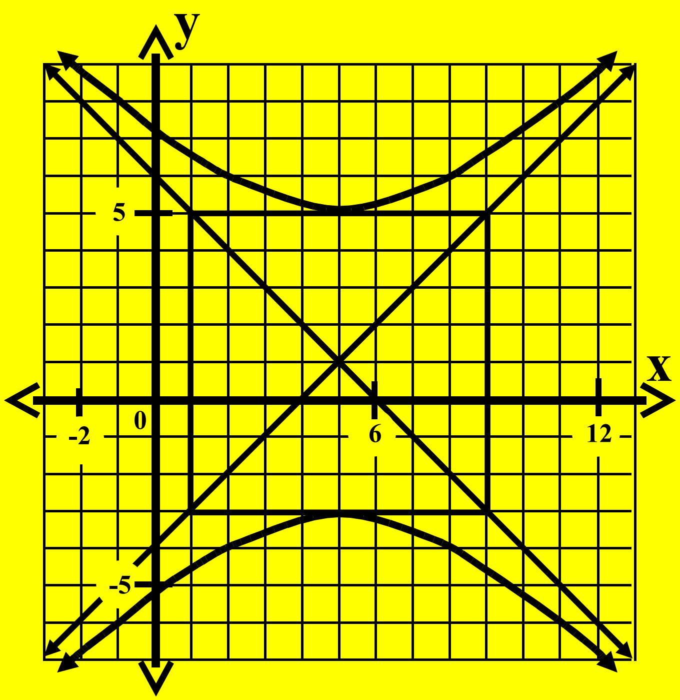

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Square the binomials.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

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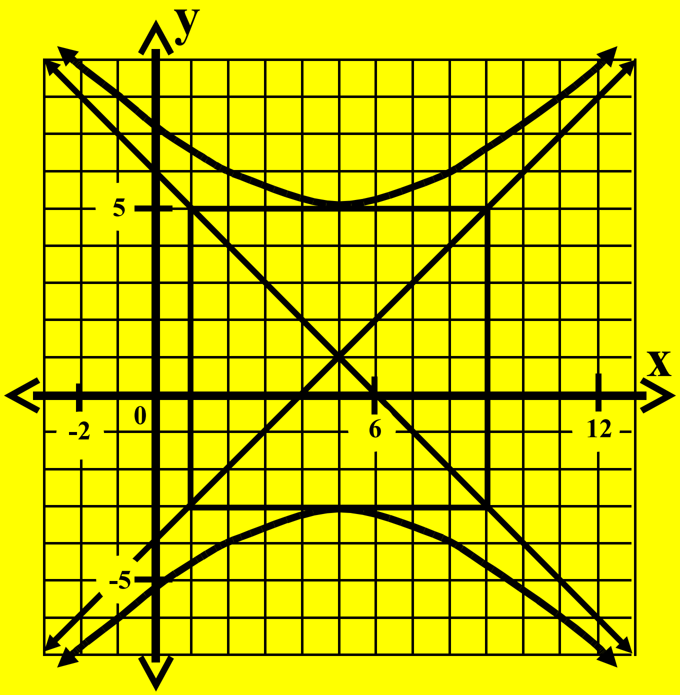

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Square the binomials.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

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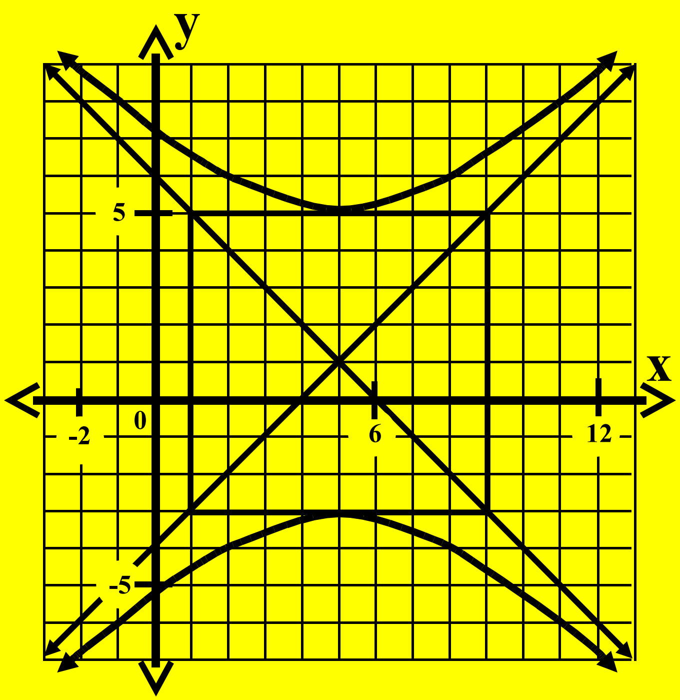

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General Form Equation

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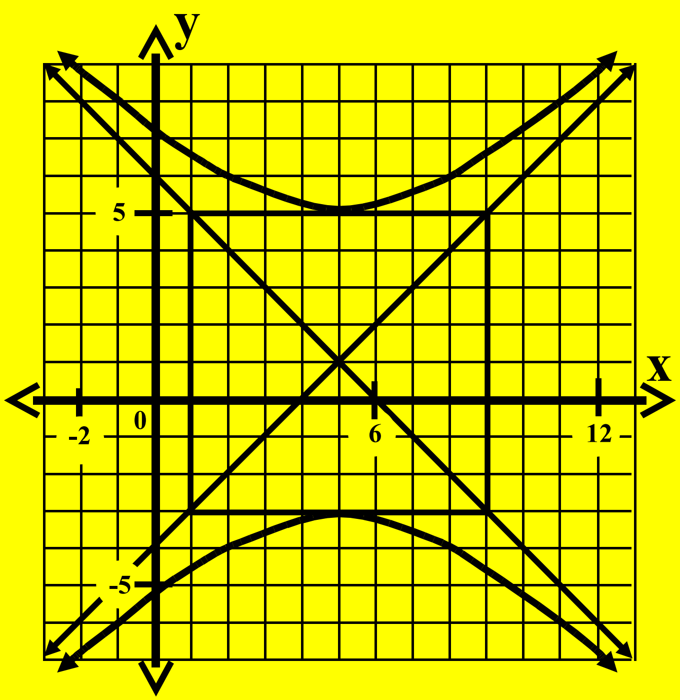

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Standard Form Equation

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$$1(y-1)^2 - 1(x-5)^2 = 16$$

$$1(y^2 - 2y + 1) - 1(x^2 - 10x + 25) = 16$$

Perform the indicated multiplication.

General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

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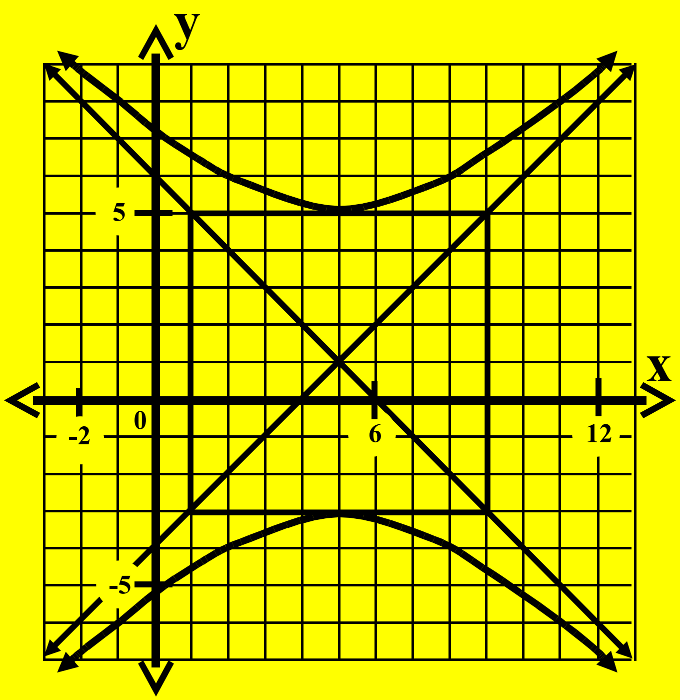

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$$1(y-1)^2 - 1(x-5)^2 = 16$$

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Perform the indicated multiplication.

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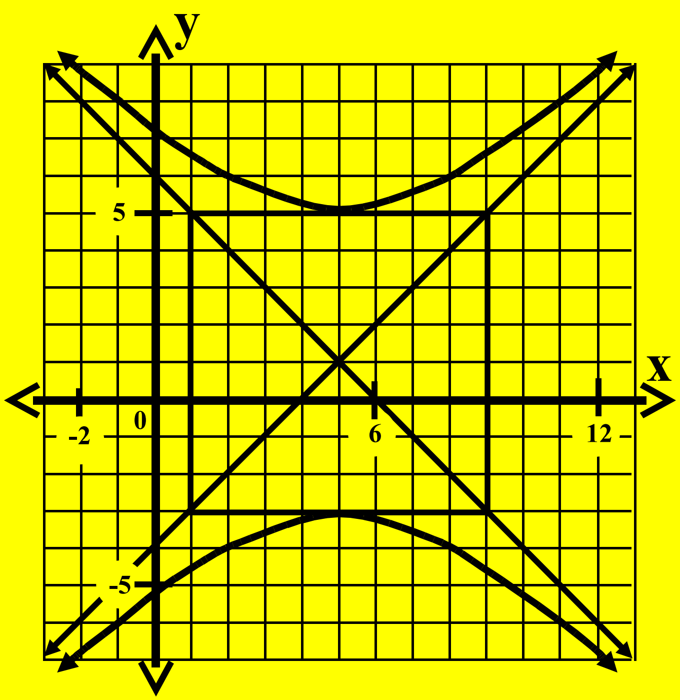

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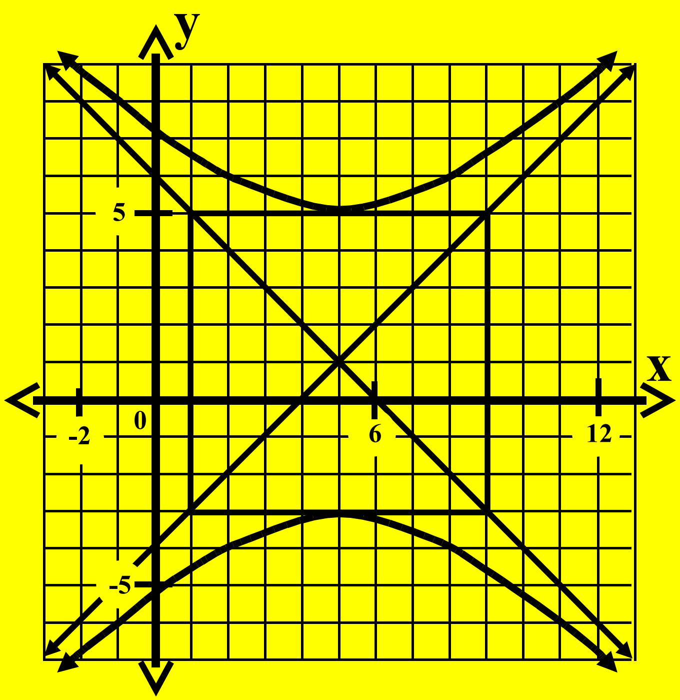

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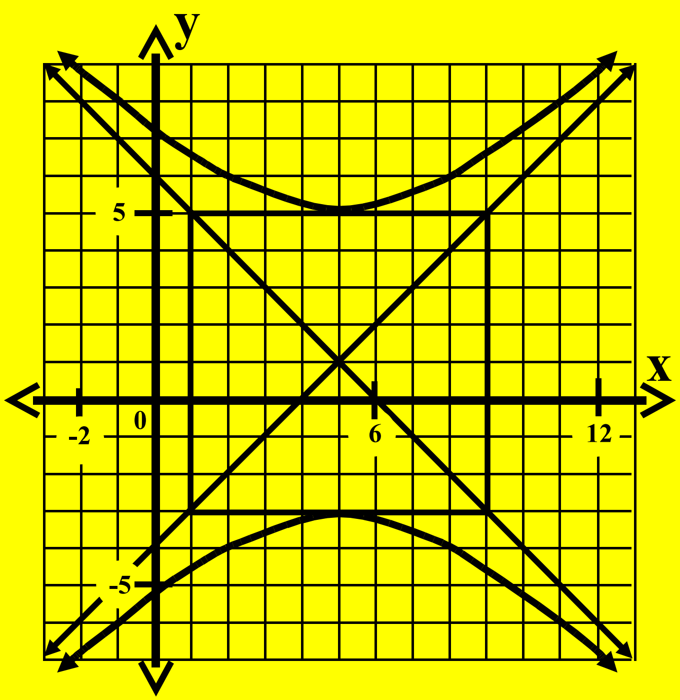

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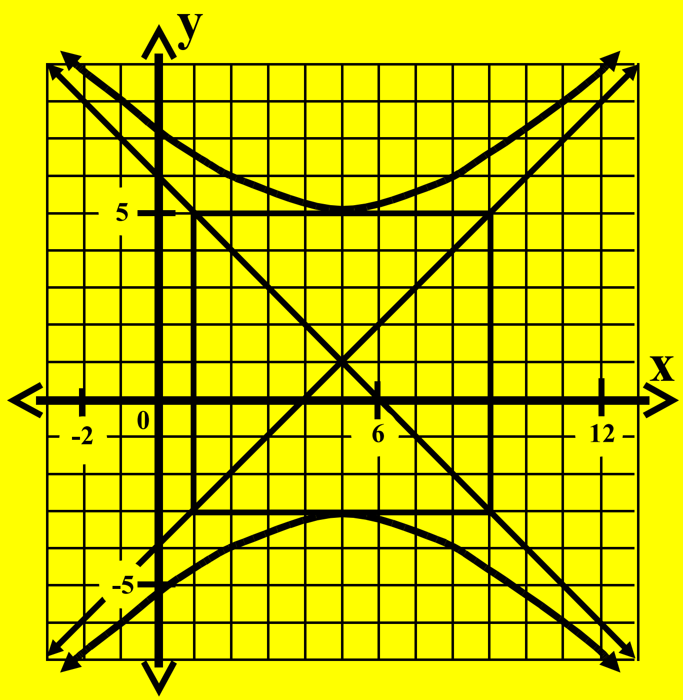

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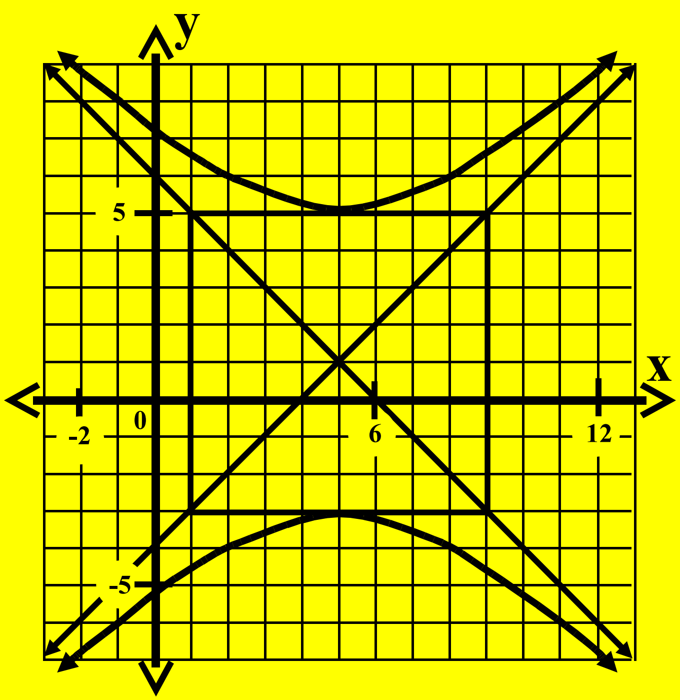

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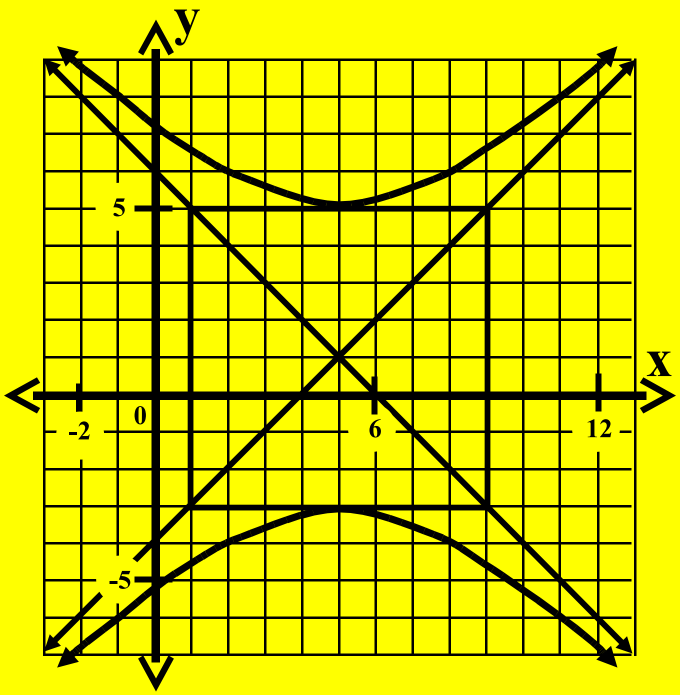

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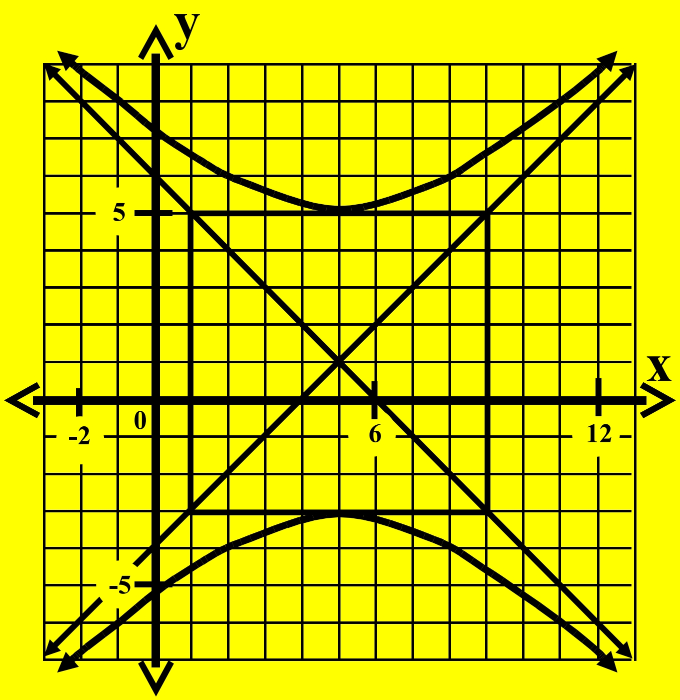

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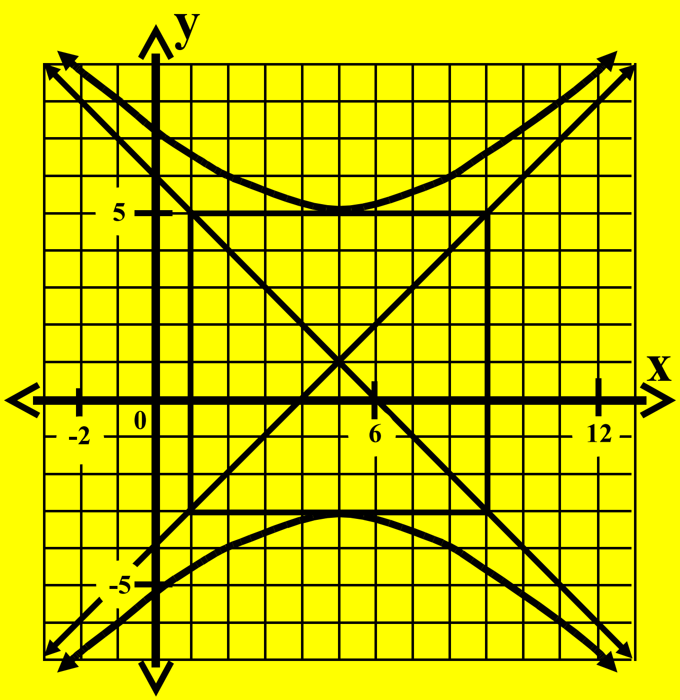

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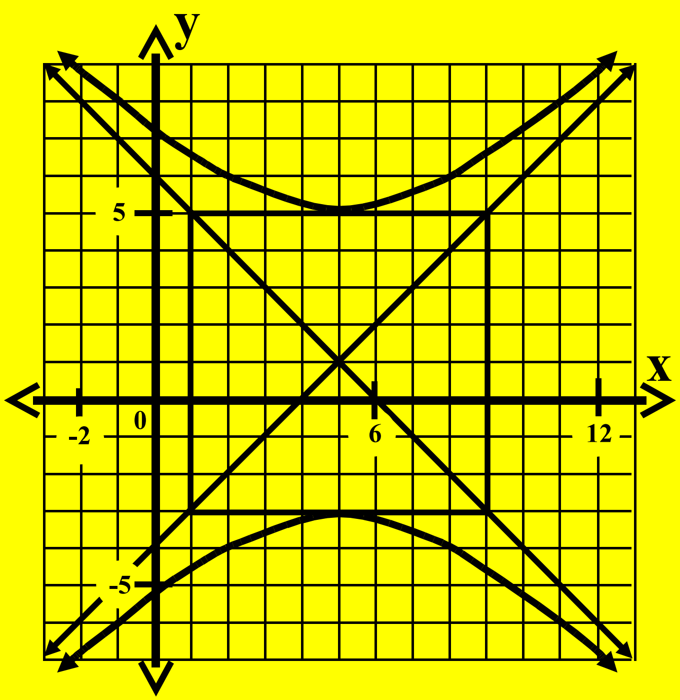

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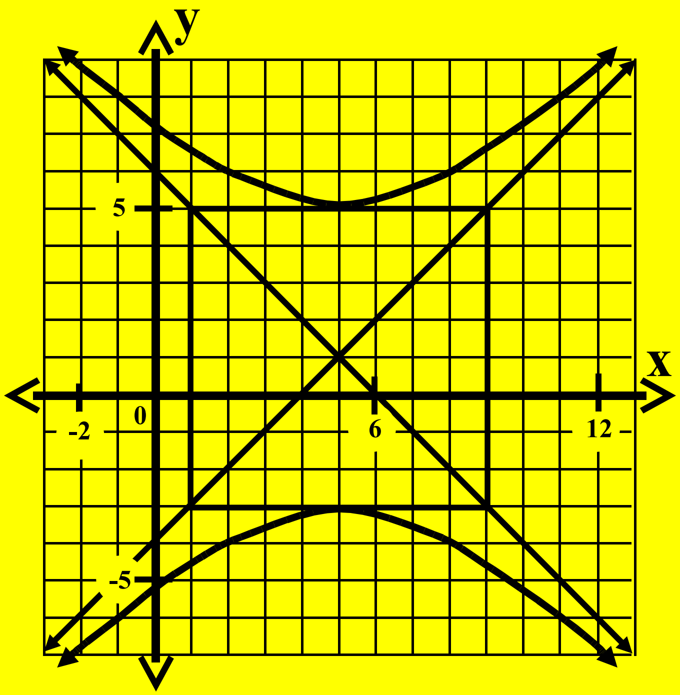

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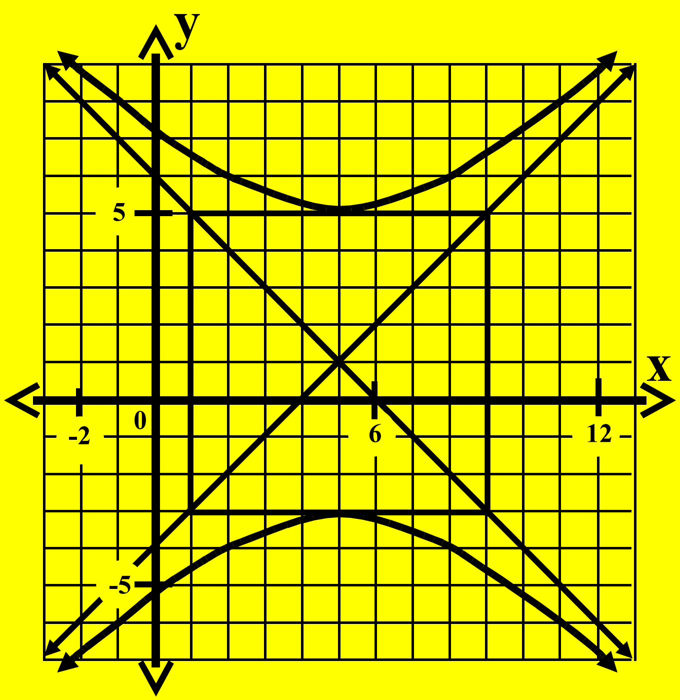

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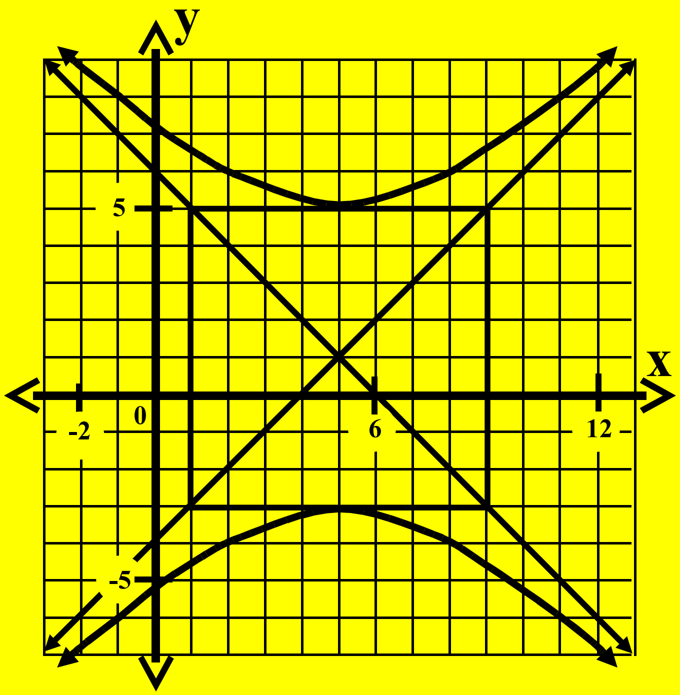

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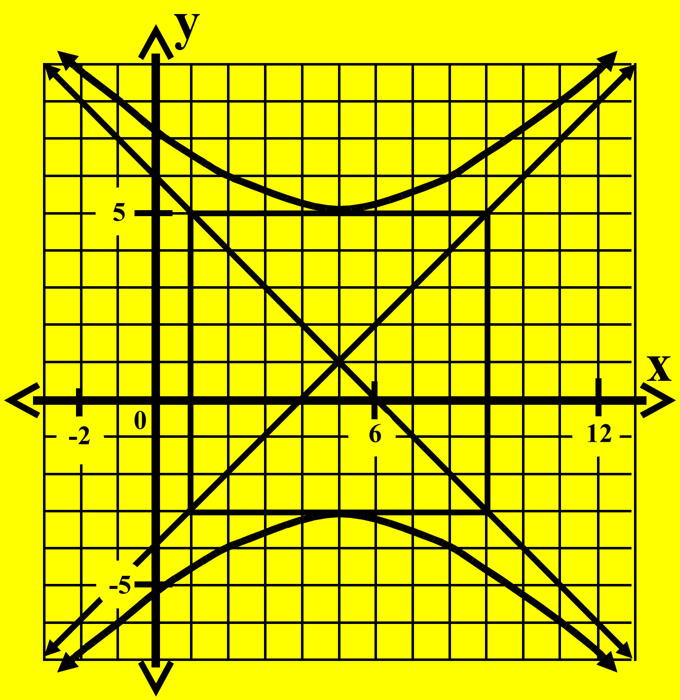

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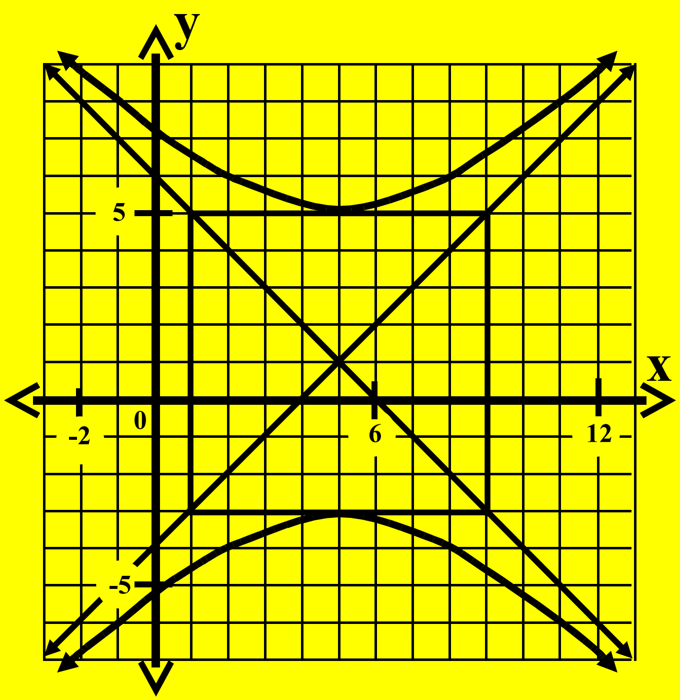

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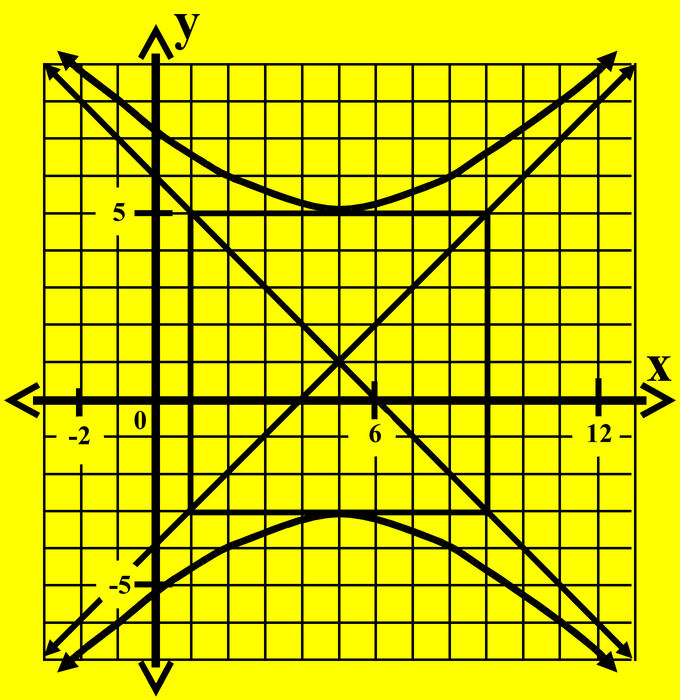

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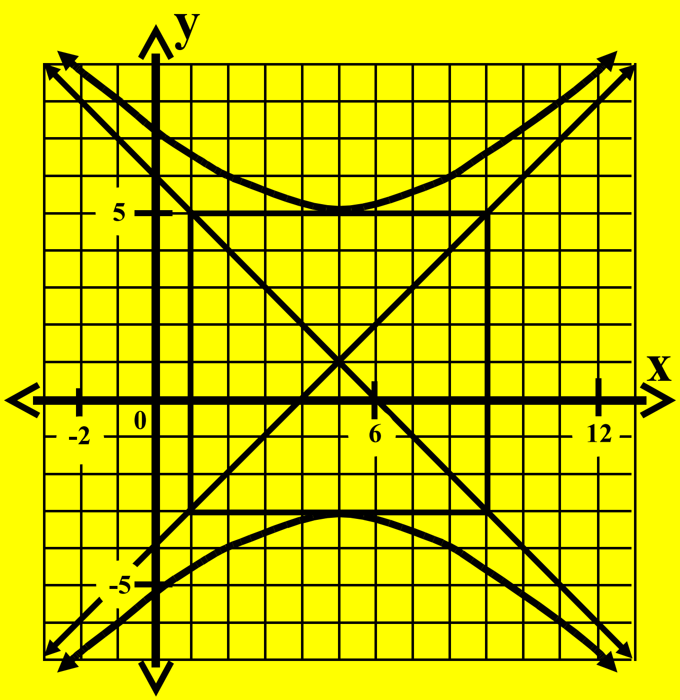

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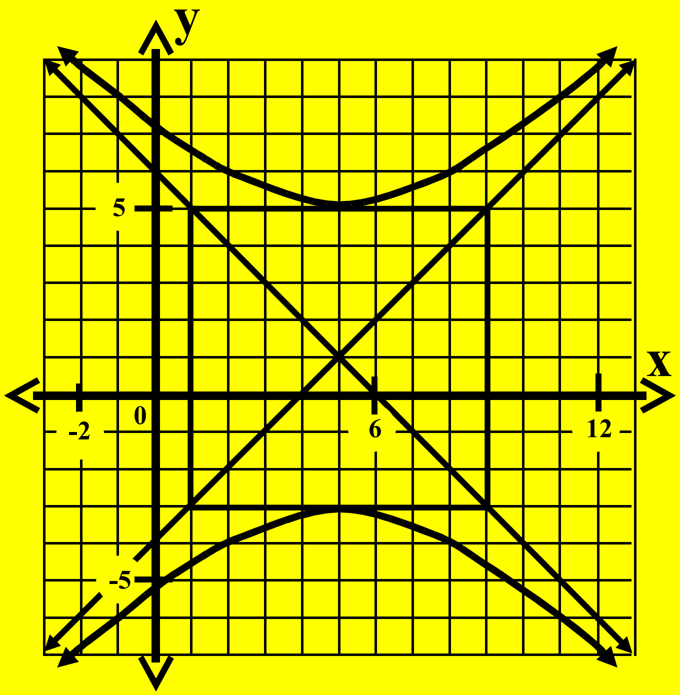

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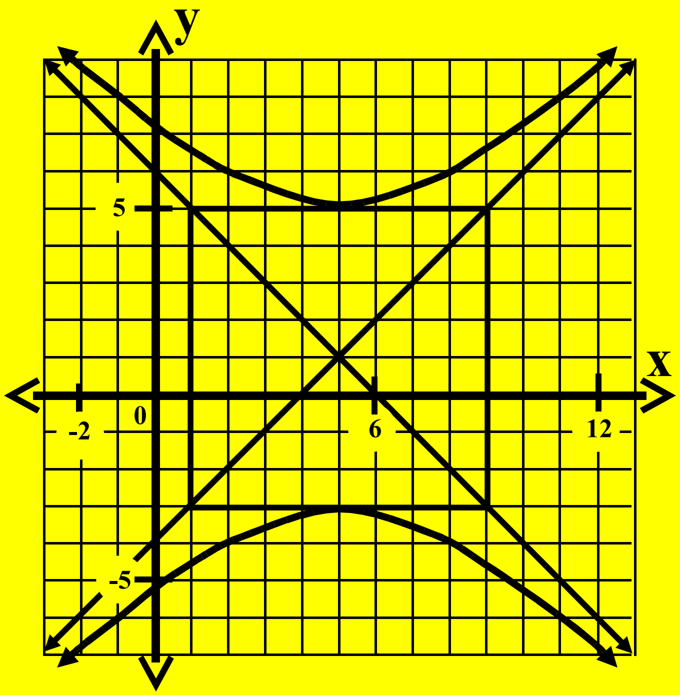

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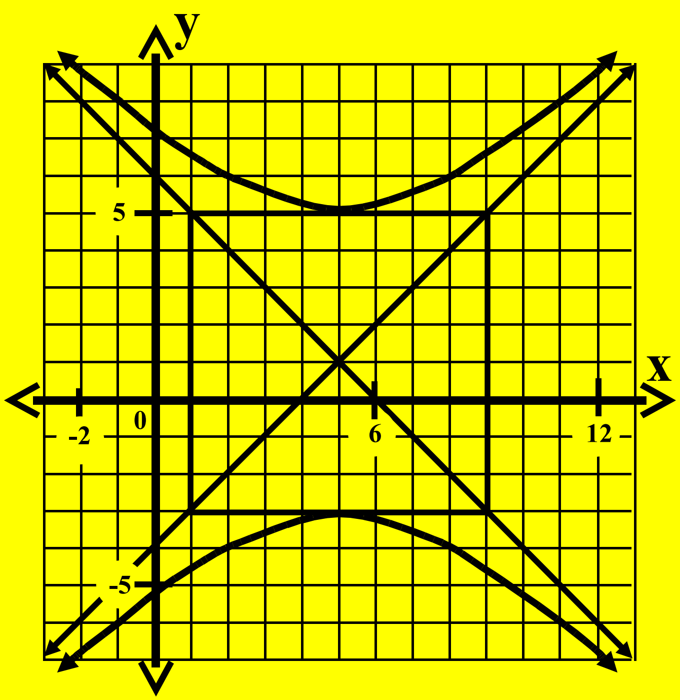

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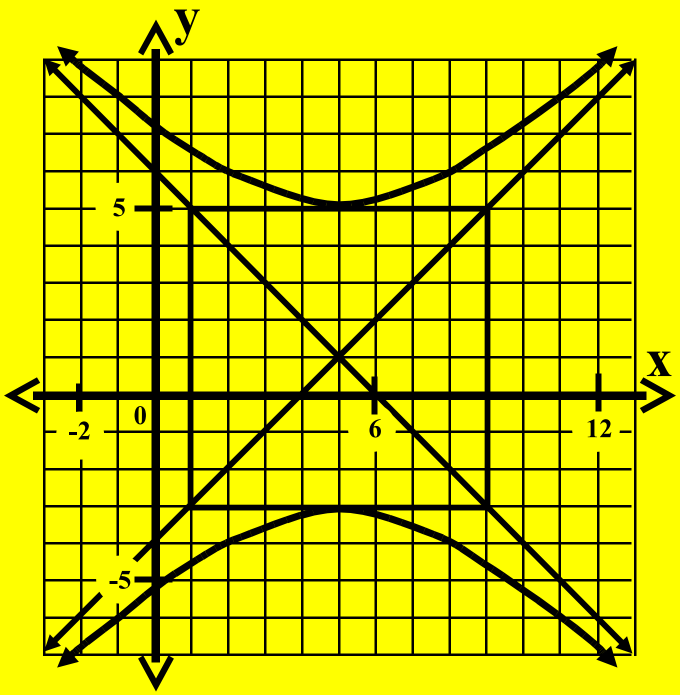

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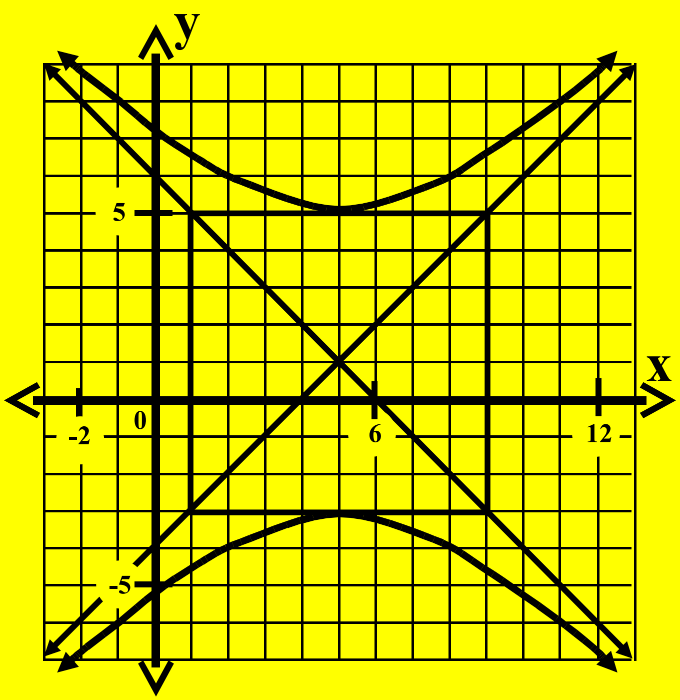

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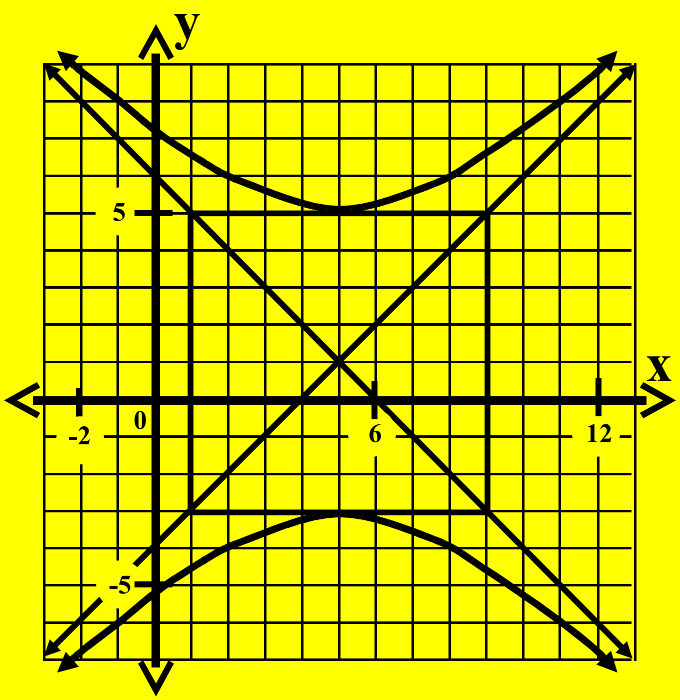

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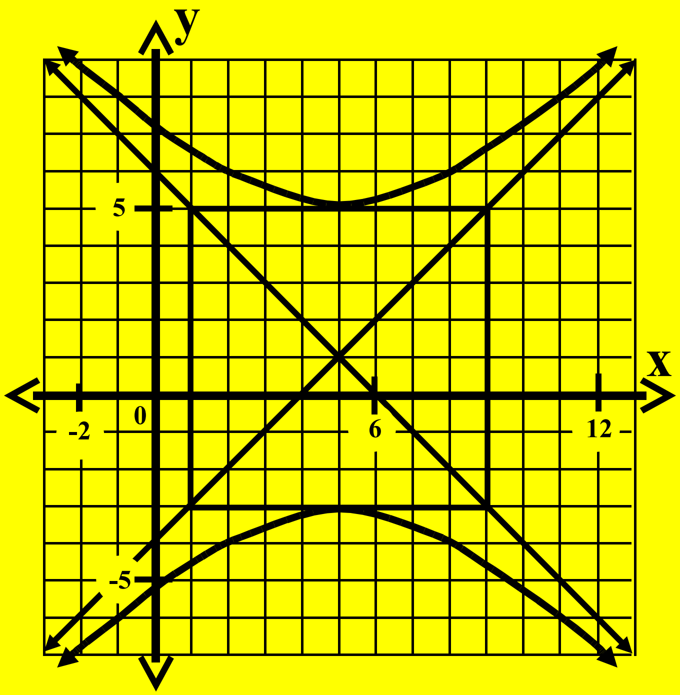

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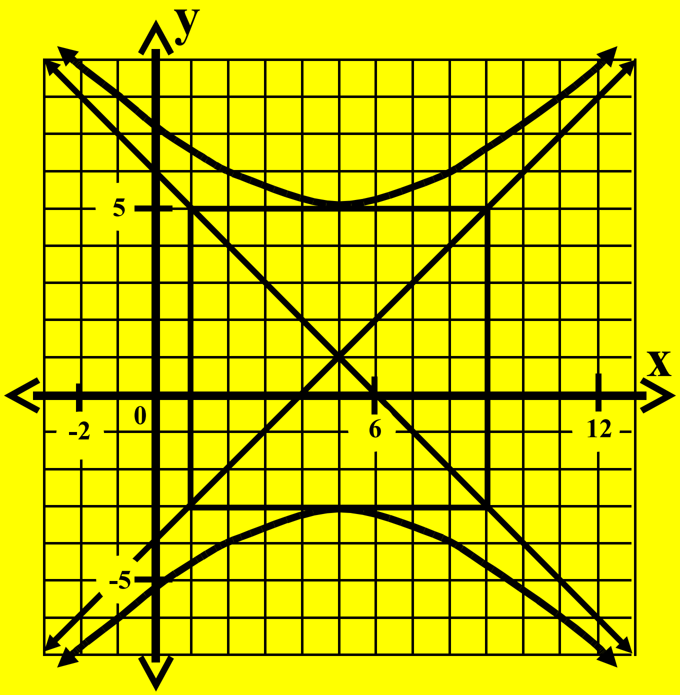

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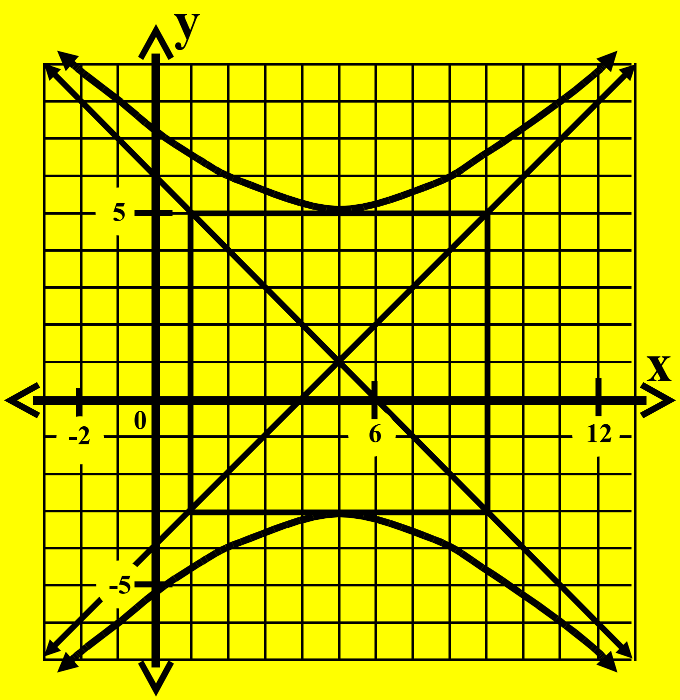

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Subtract 16 from both sides.

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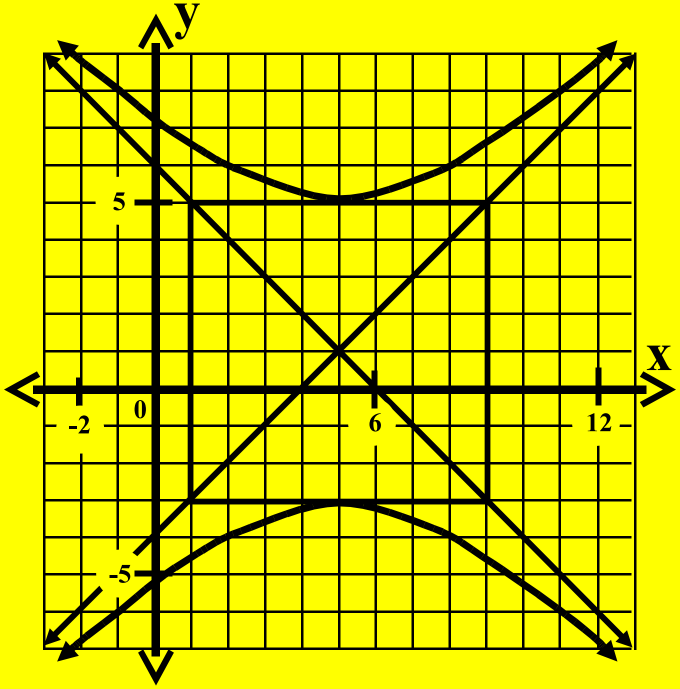

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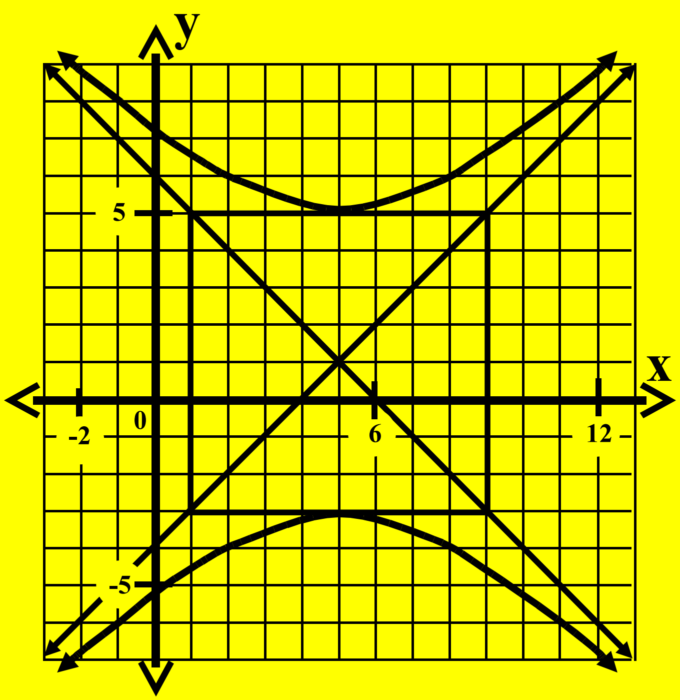

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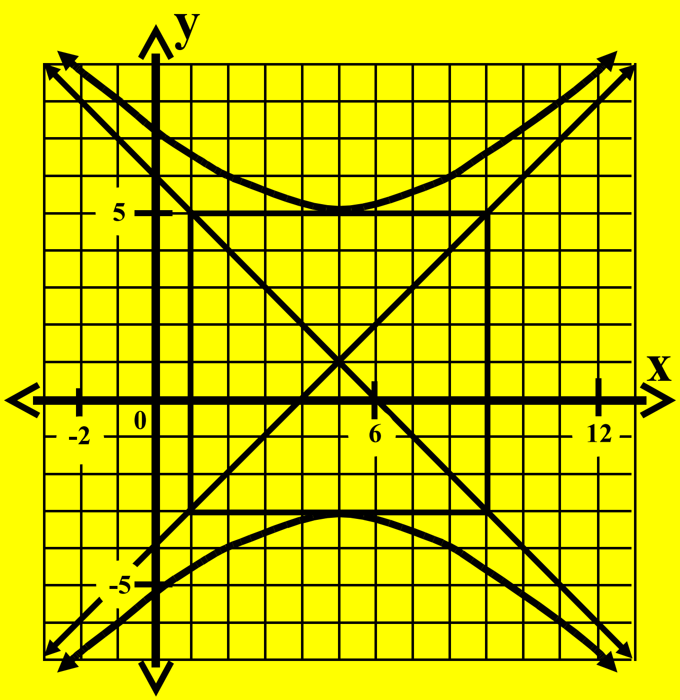

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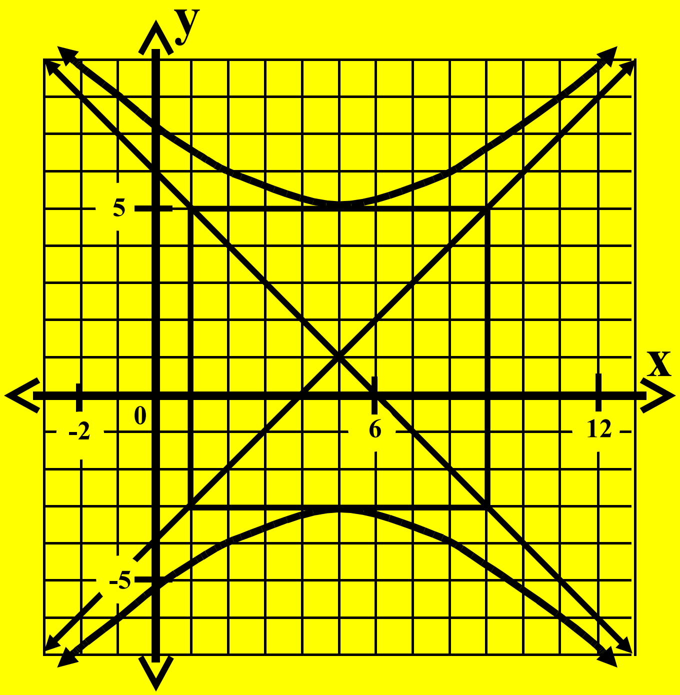

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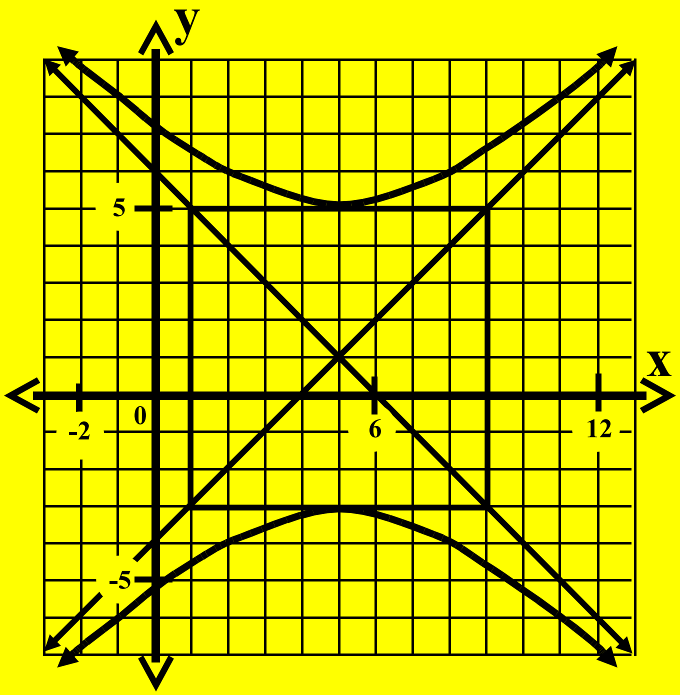

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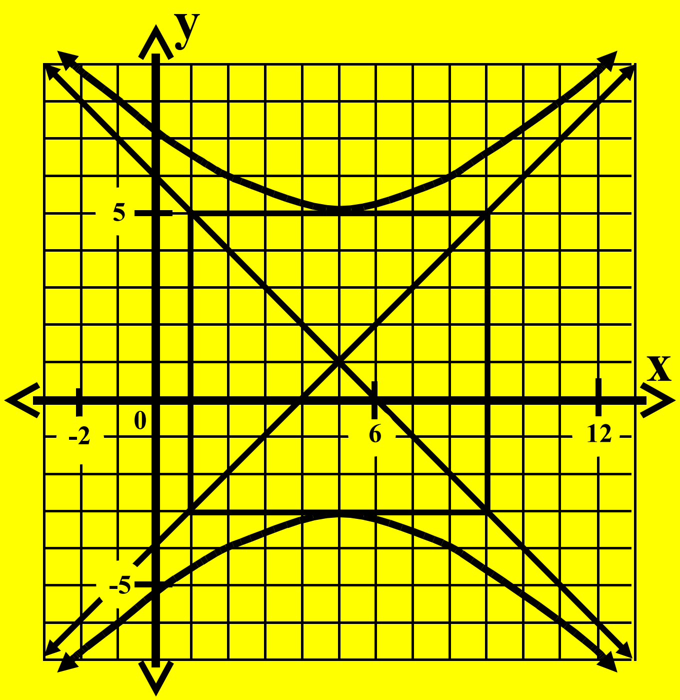

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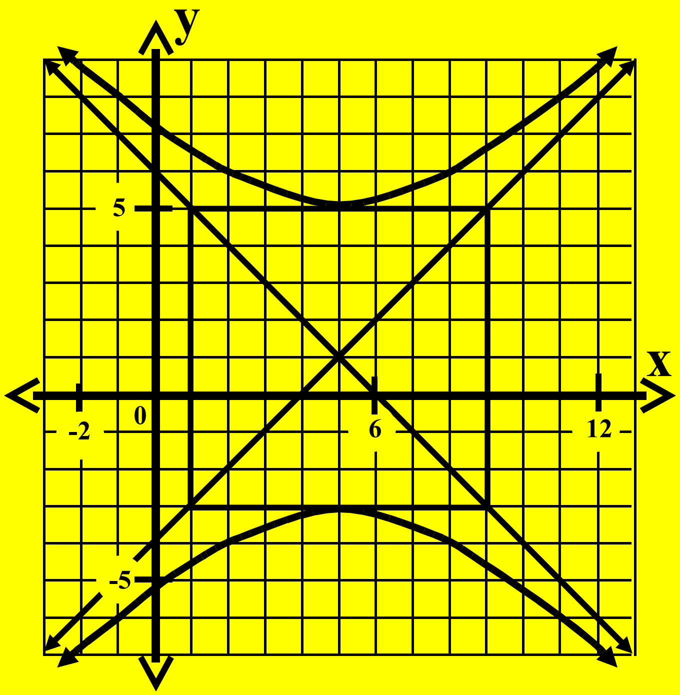

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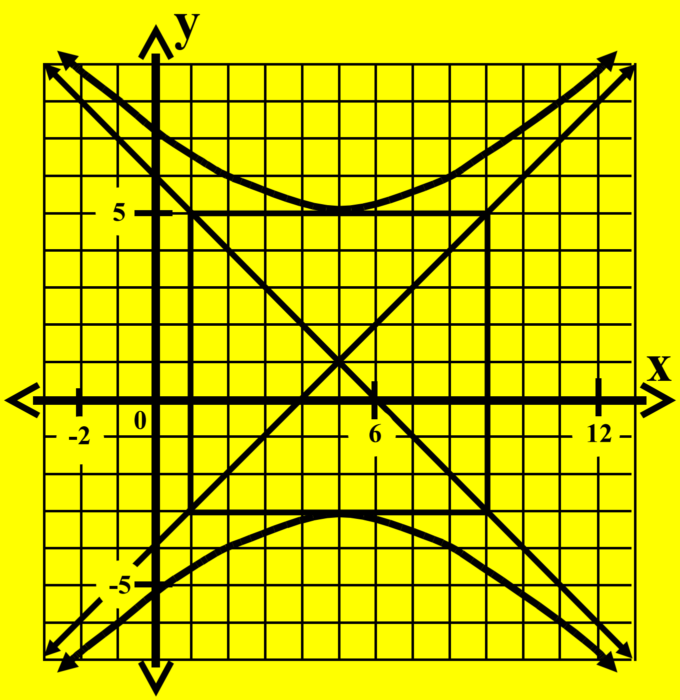

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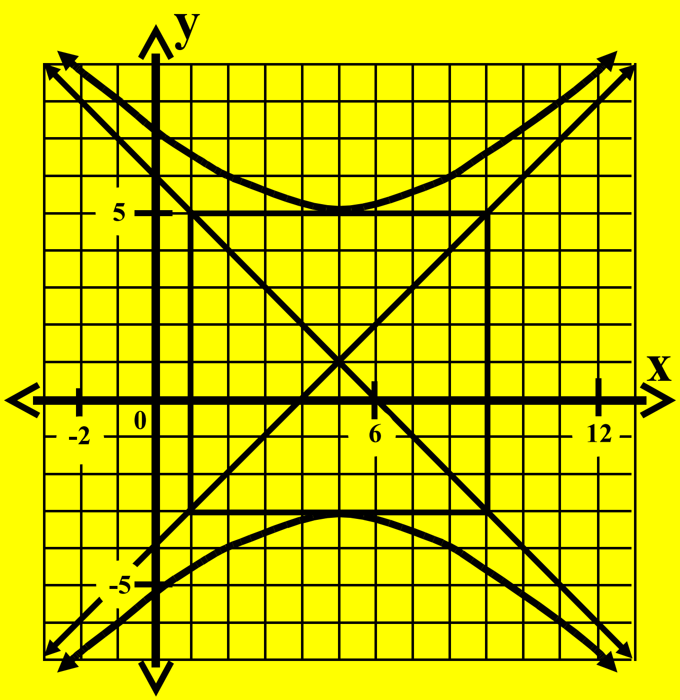

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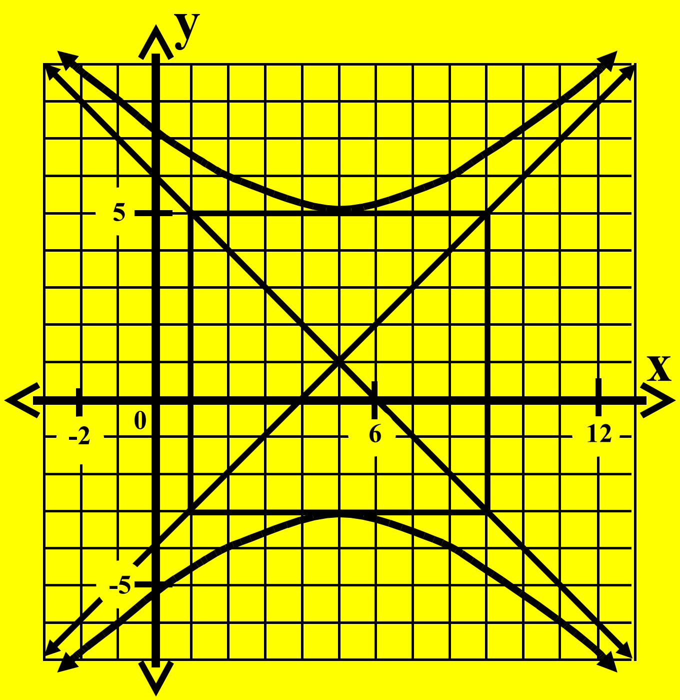

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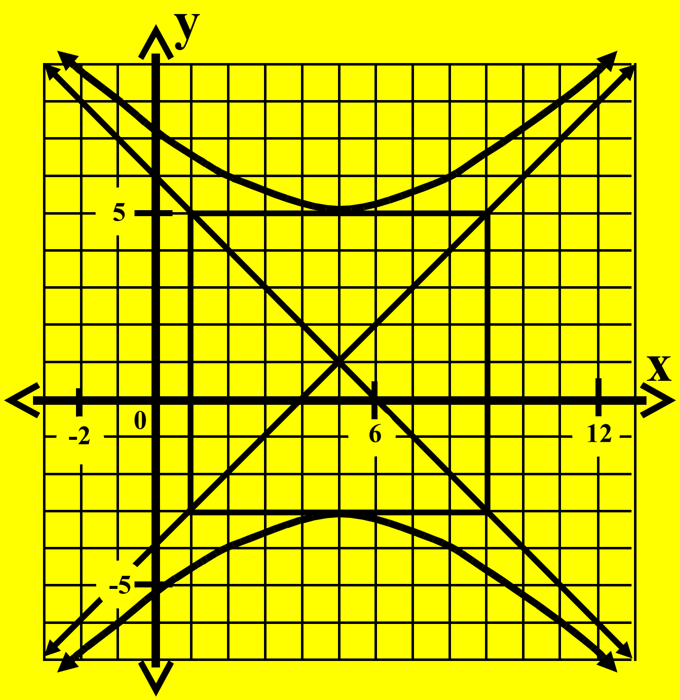

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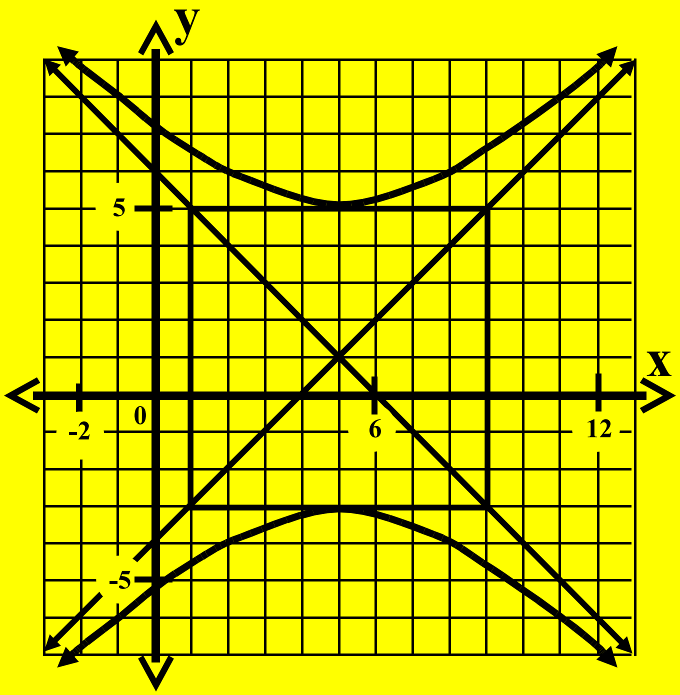

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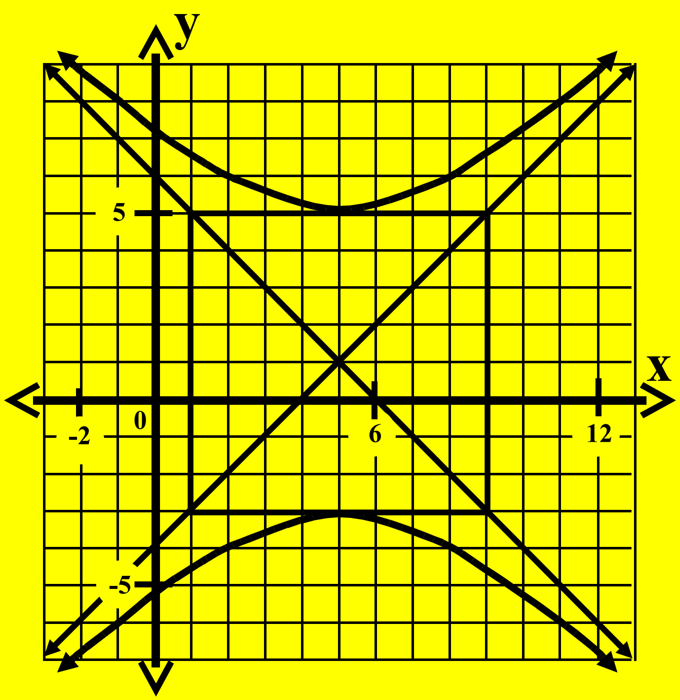

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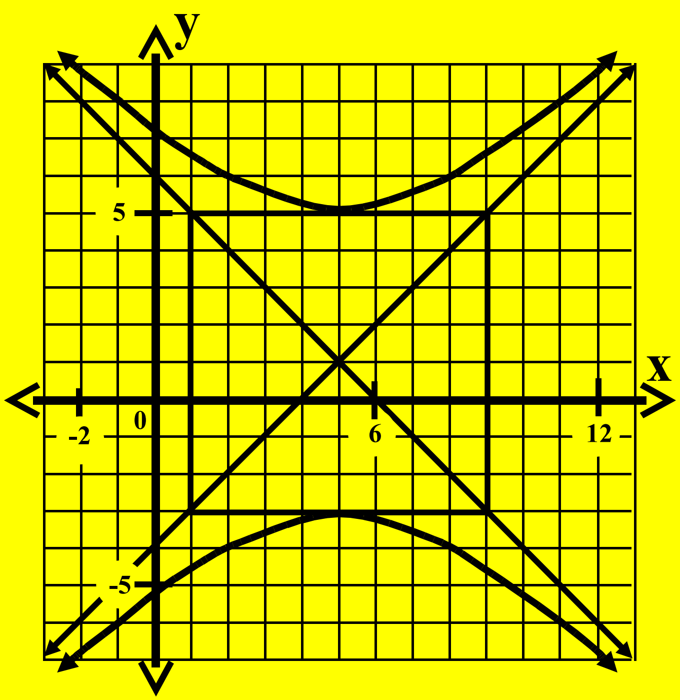

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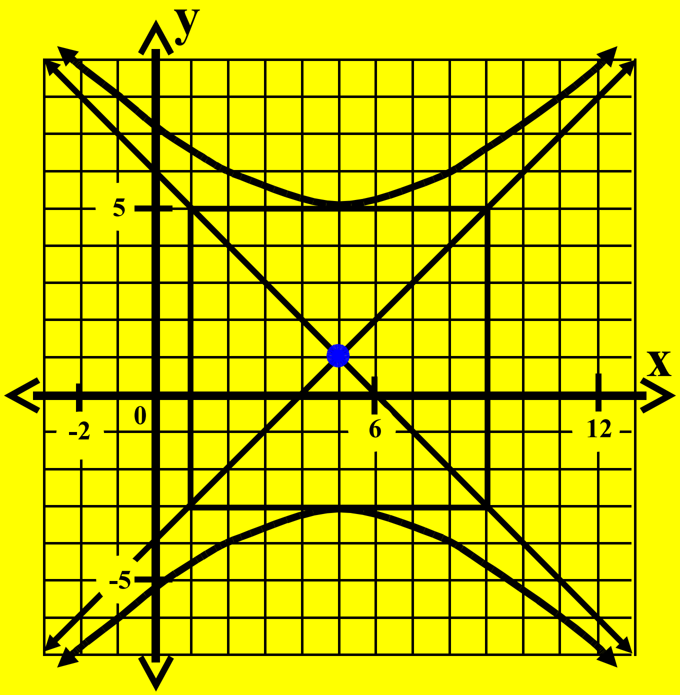

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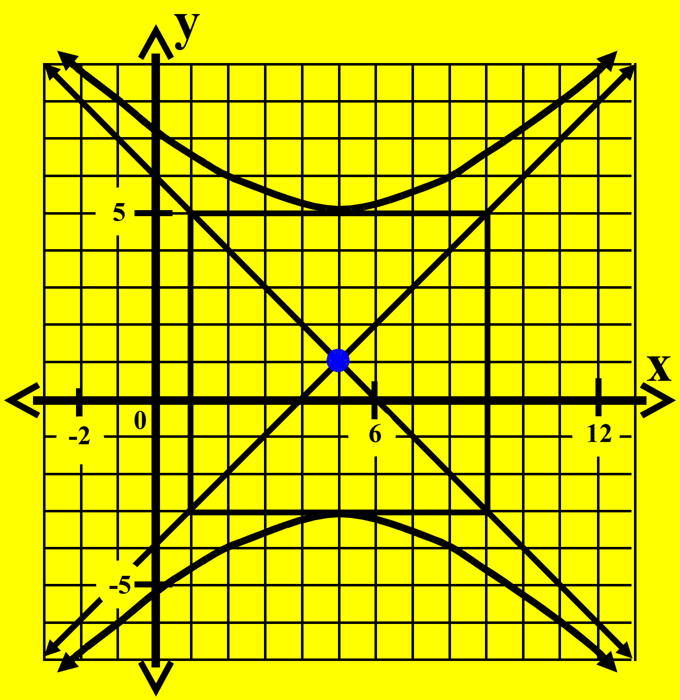

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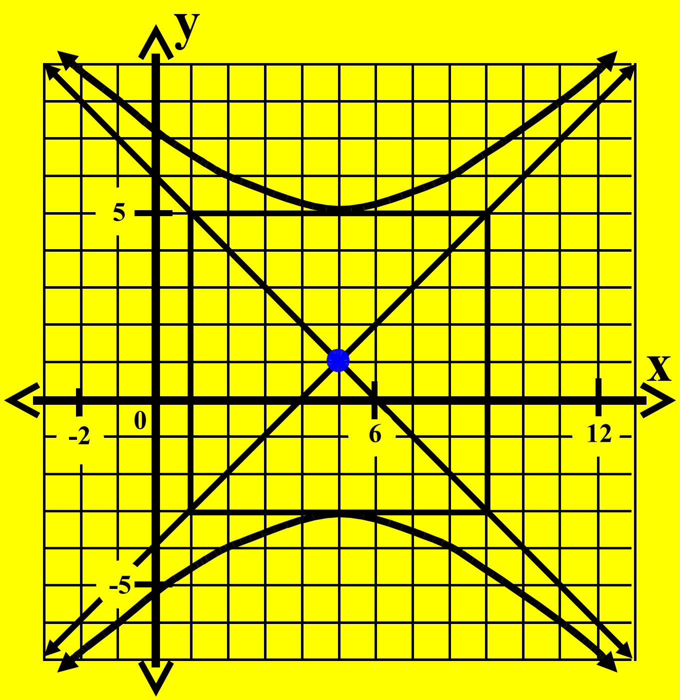

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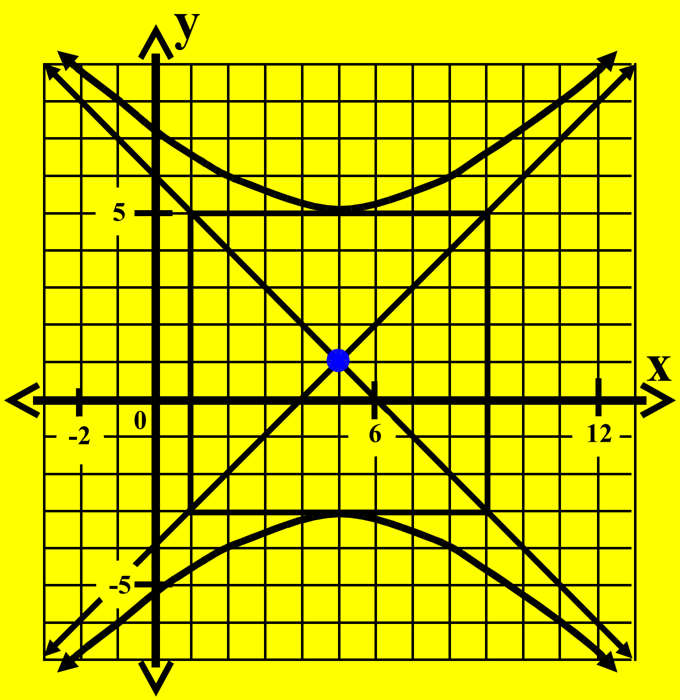

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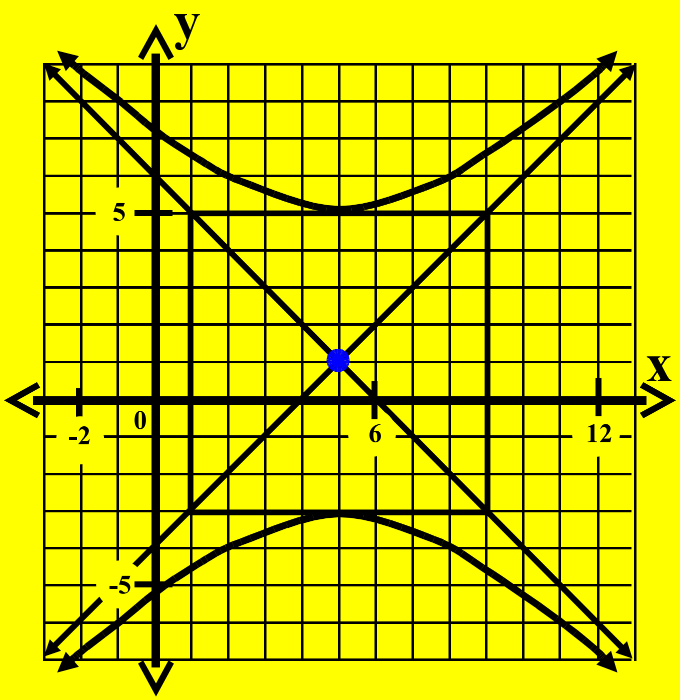

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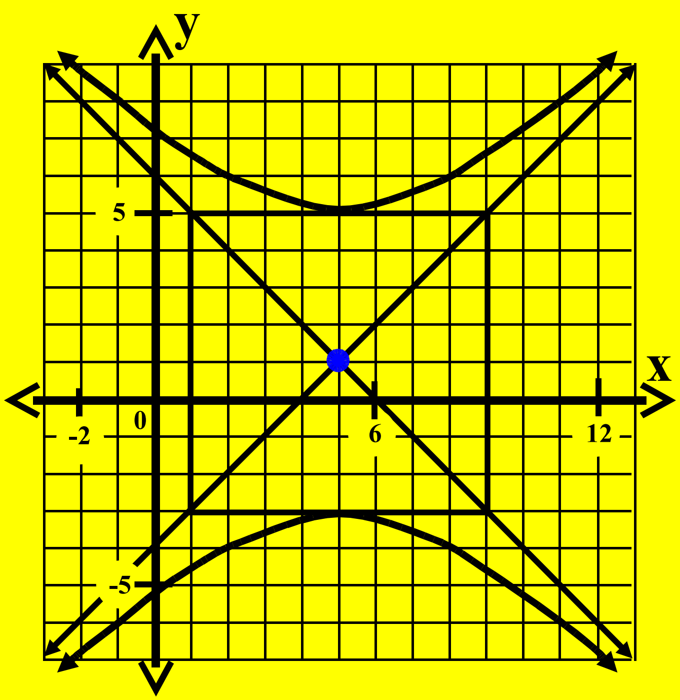

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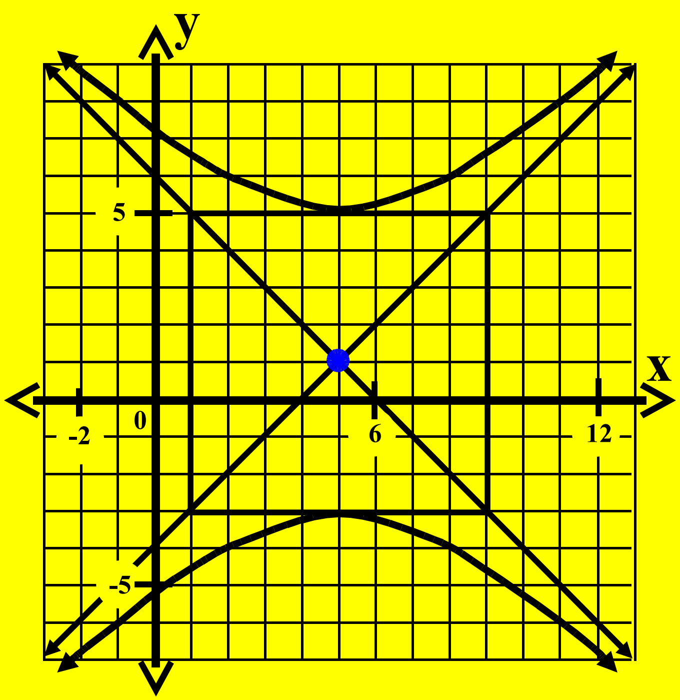

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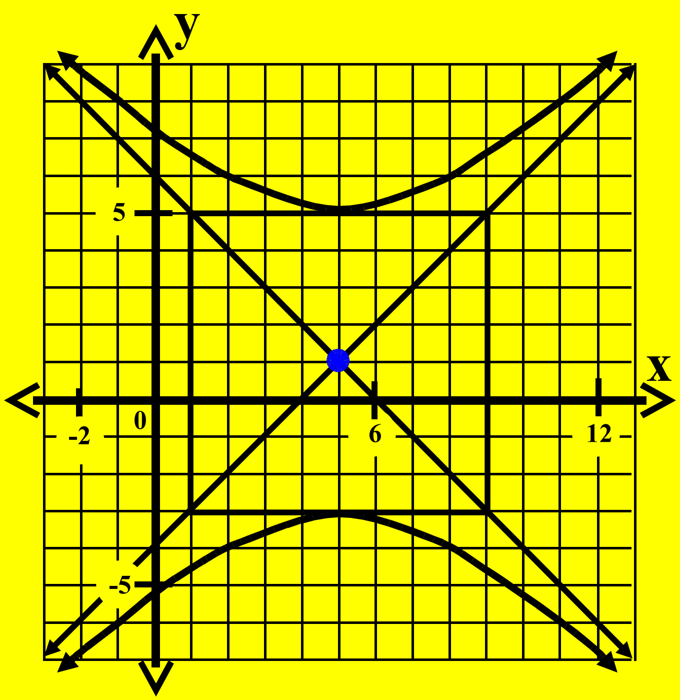

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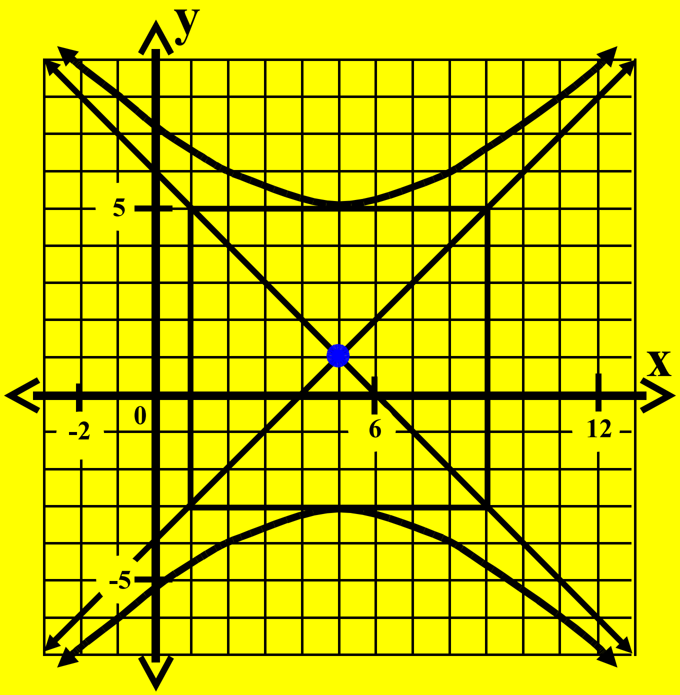

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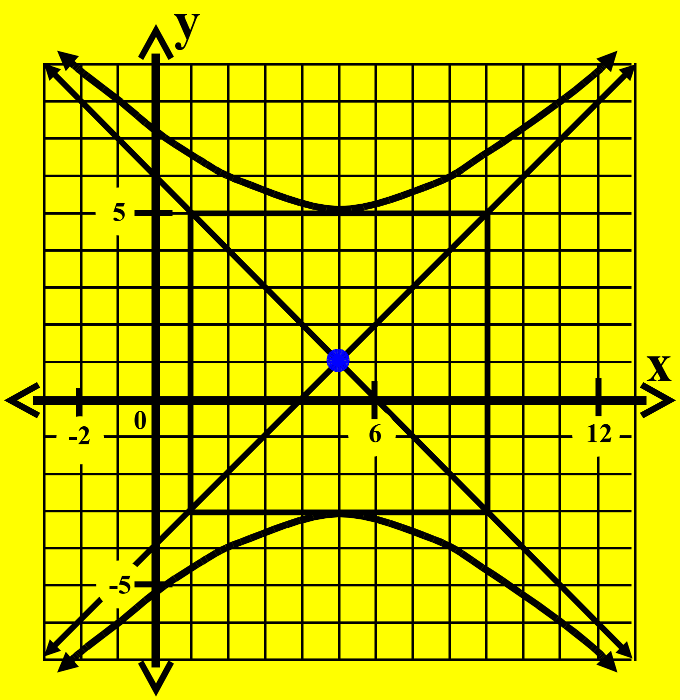

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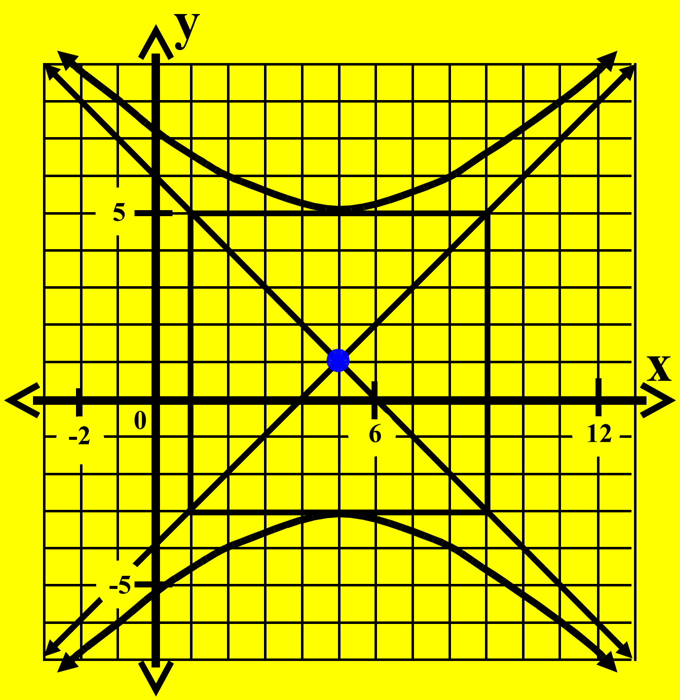

This a type 2 Hyperbola.
(The transverse axis is vertical.)

Standard Form Equation

$$\frac{(y-1)^2}{16} - \frac{(x-5)^2}{16} = 1$$

General Form Equation

$$x^2 - y^2 - 10x + 2y + 40 = 0$$

Each focus is c units from the center where

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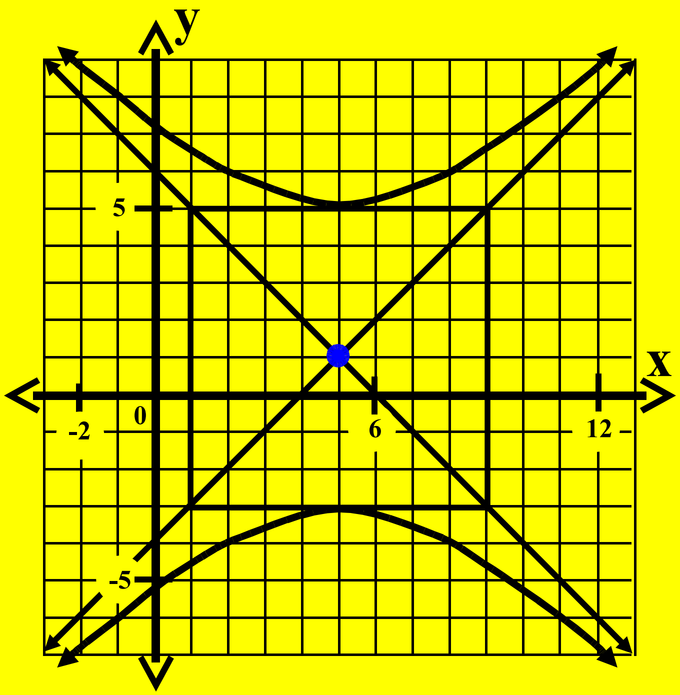

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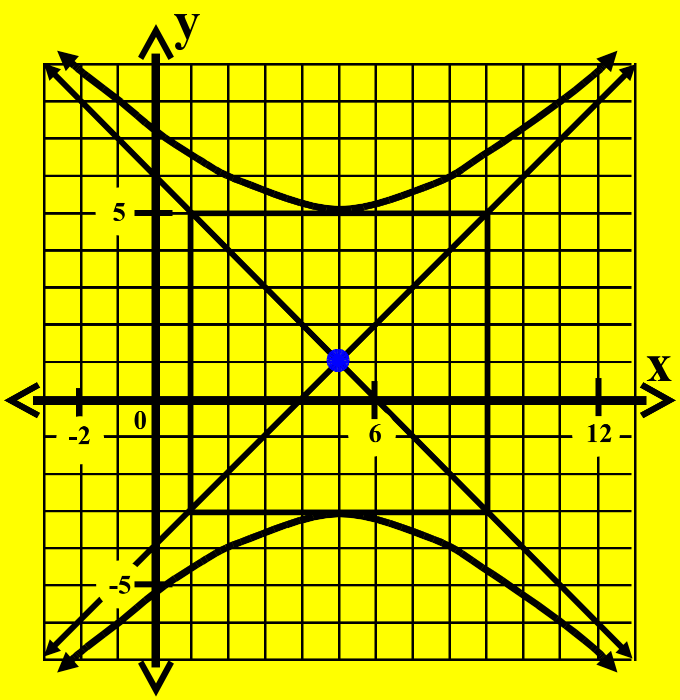

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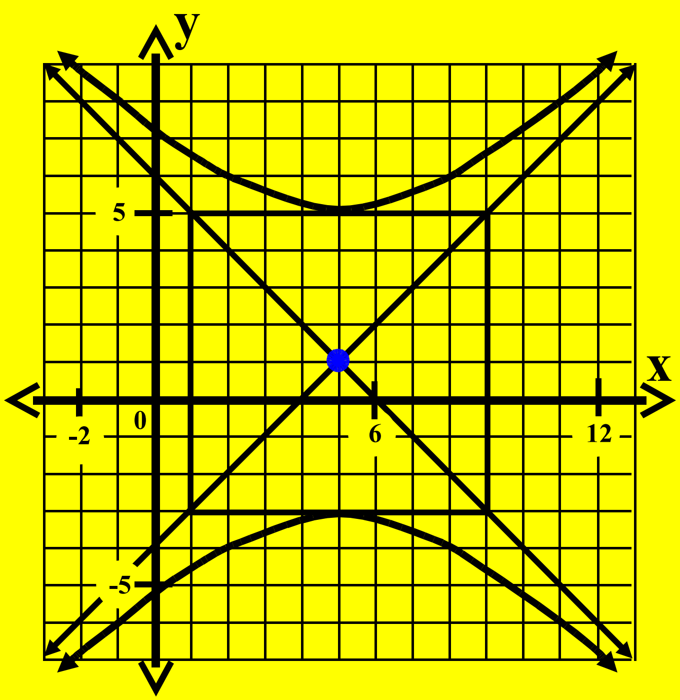

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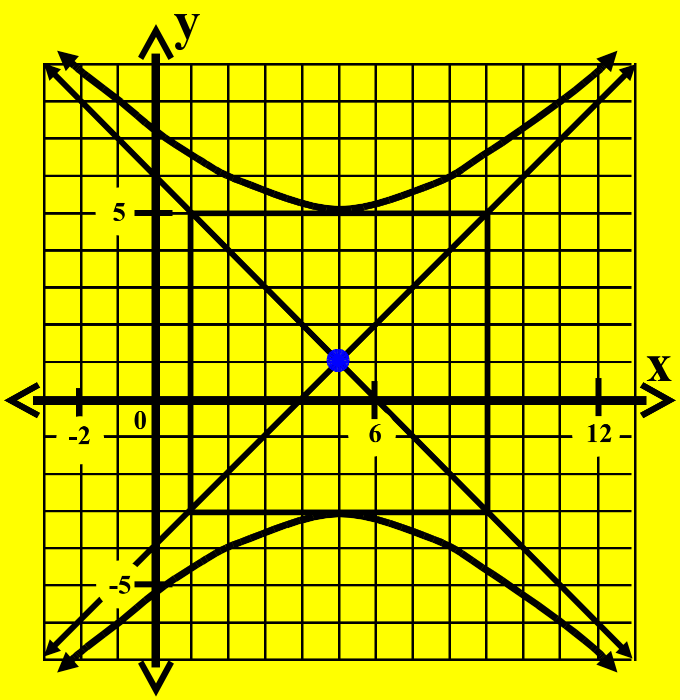

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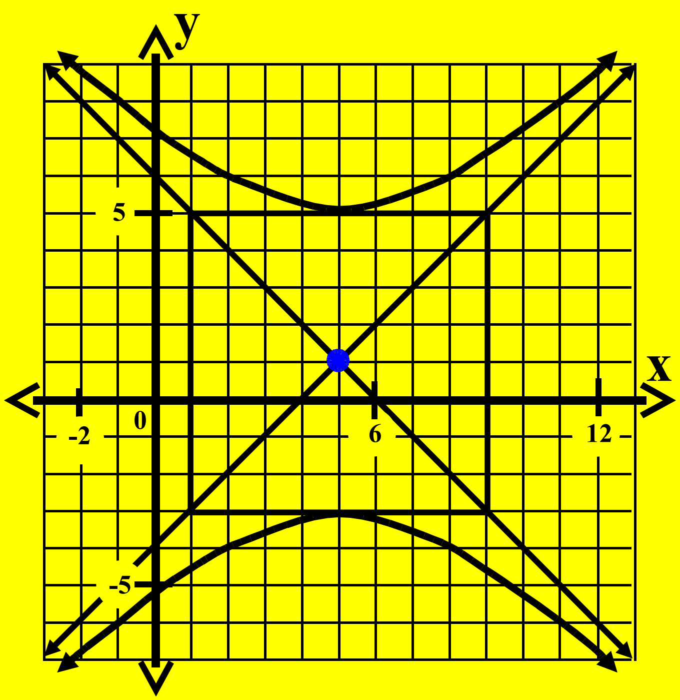

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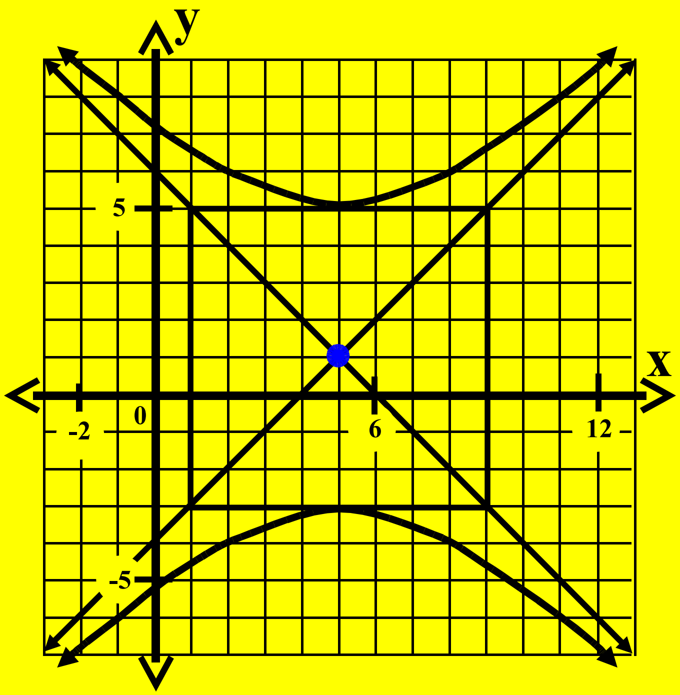

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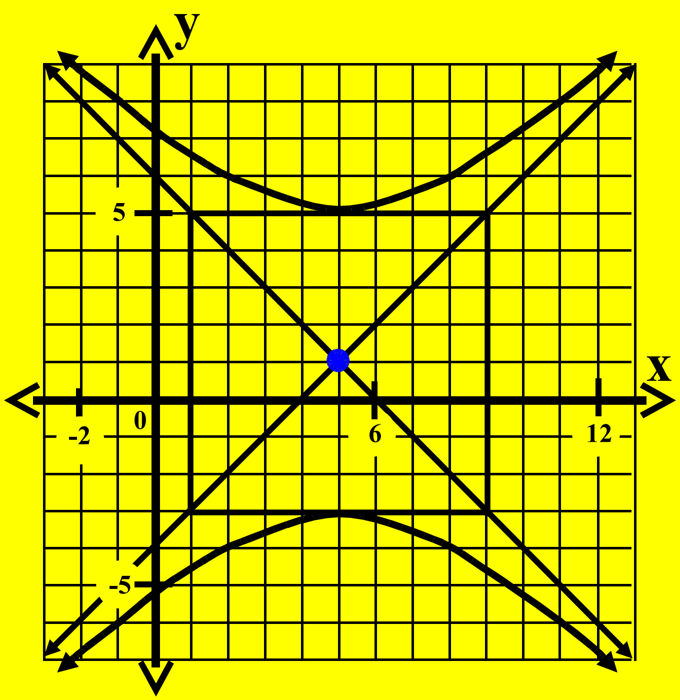

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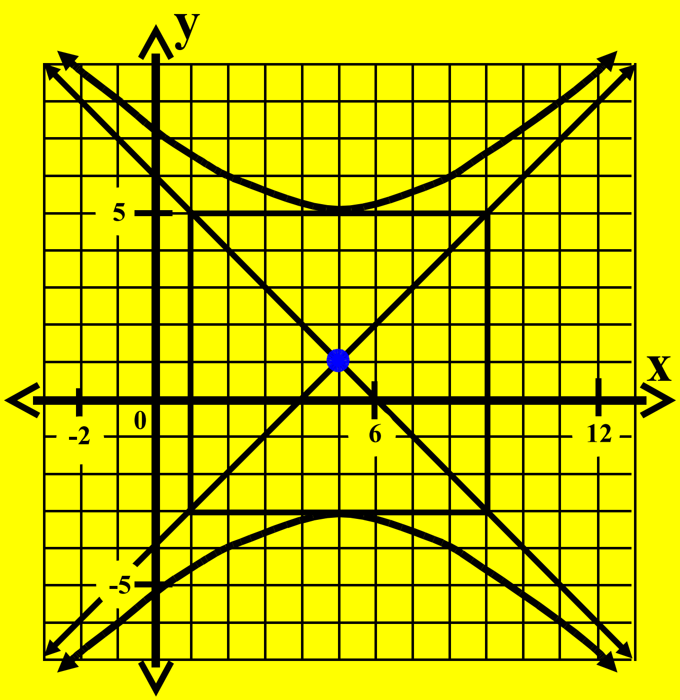

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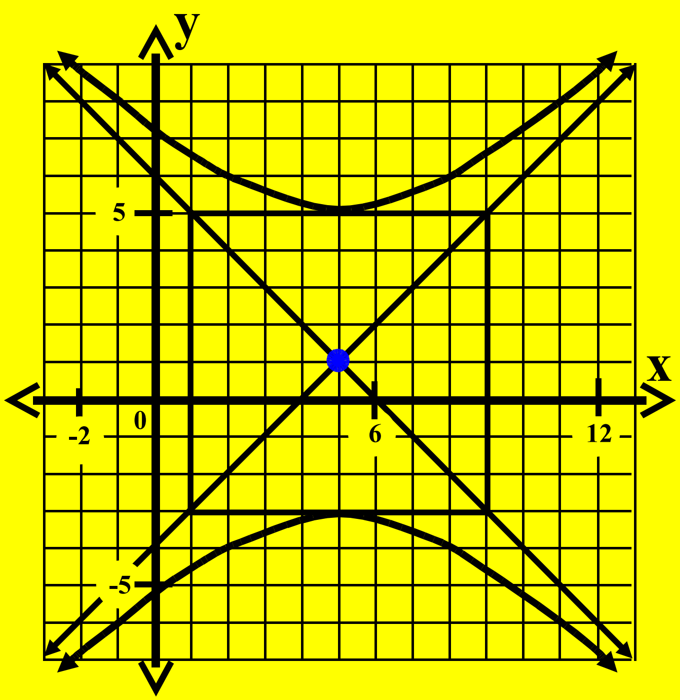

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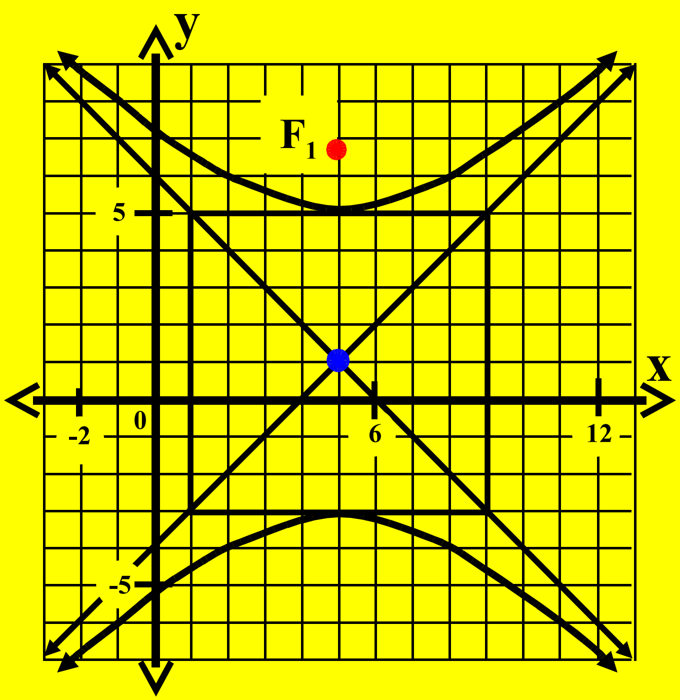

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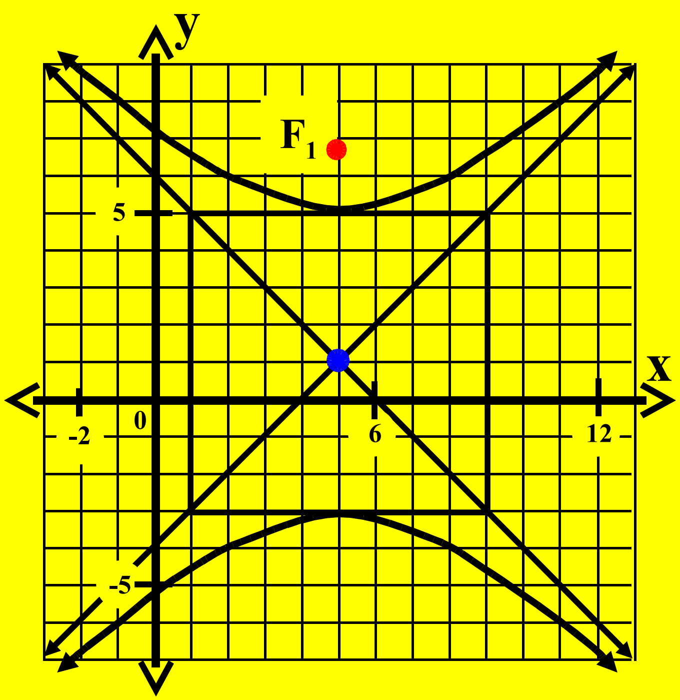

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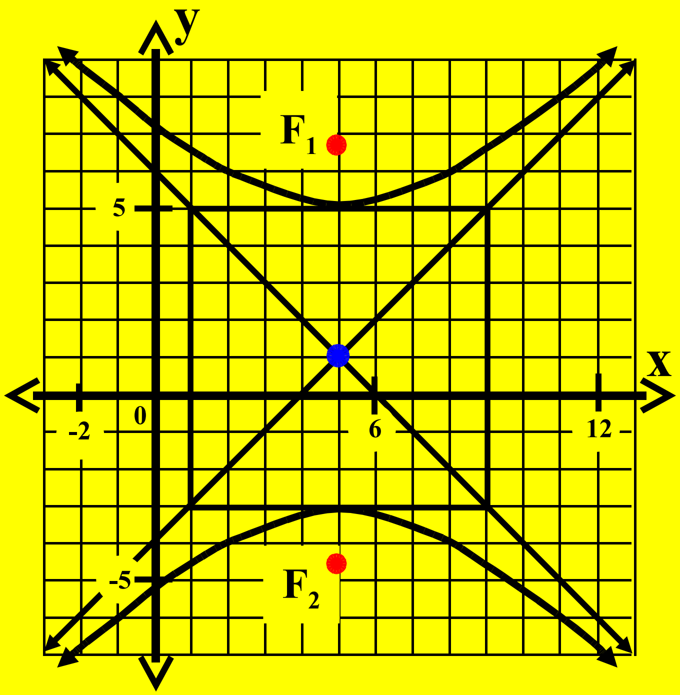

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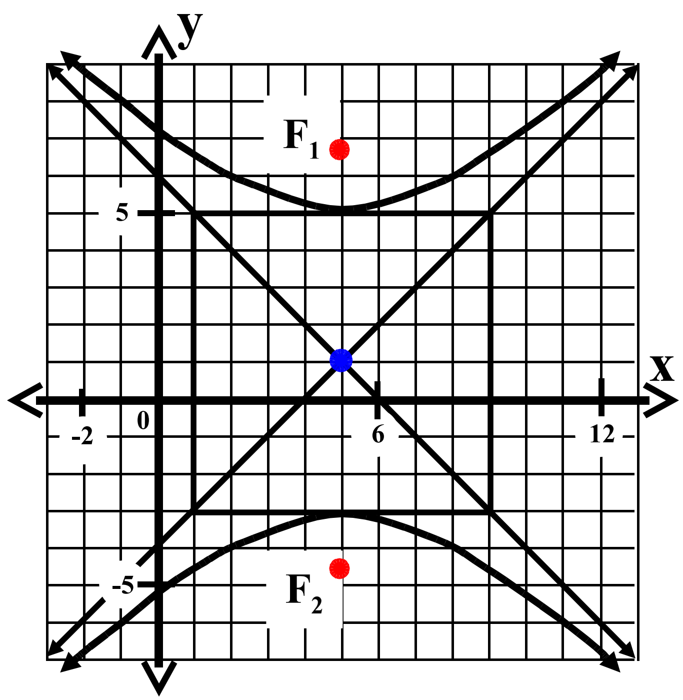

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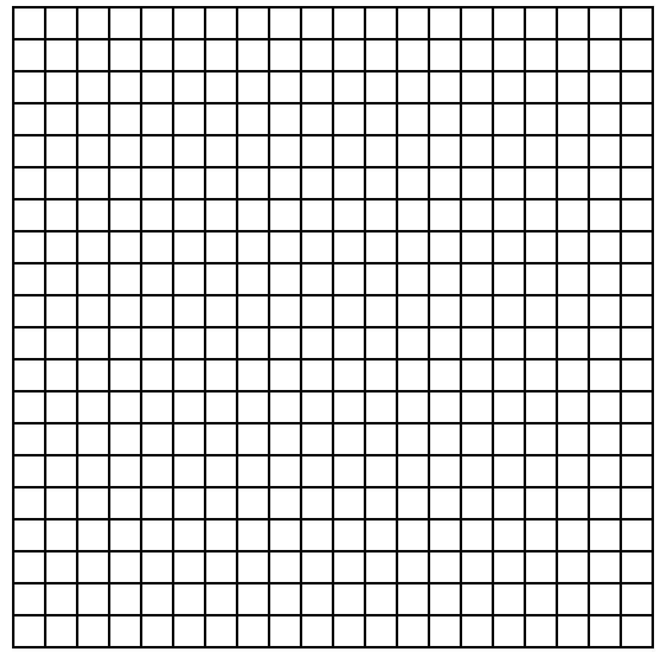
Express each equation using 'standard form' and sketch a graph.

3. $9x^2 - 16y^2 + 54x + 160y - 463 = 0$



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This is the general form equation of a hyperbola.

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General Form Equation

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

$$AC < 0$$

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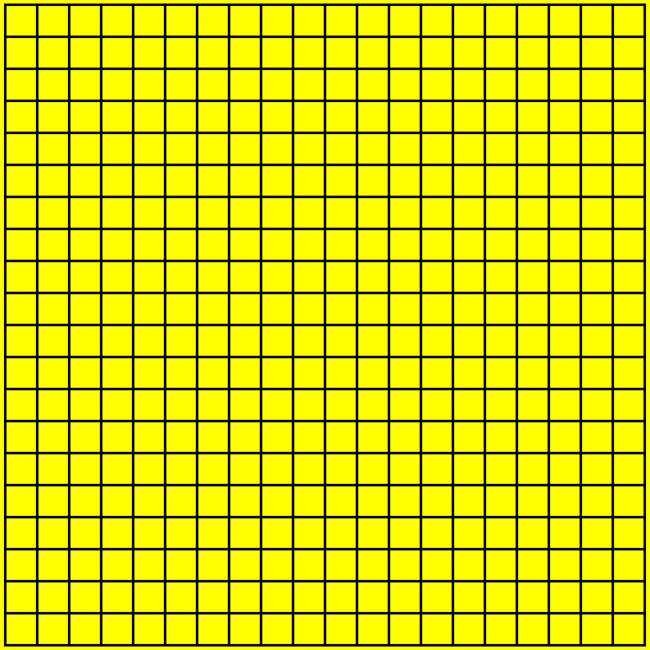

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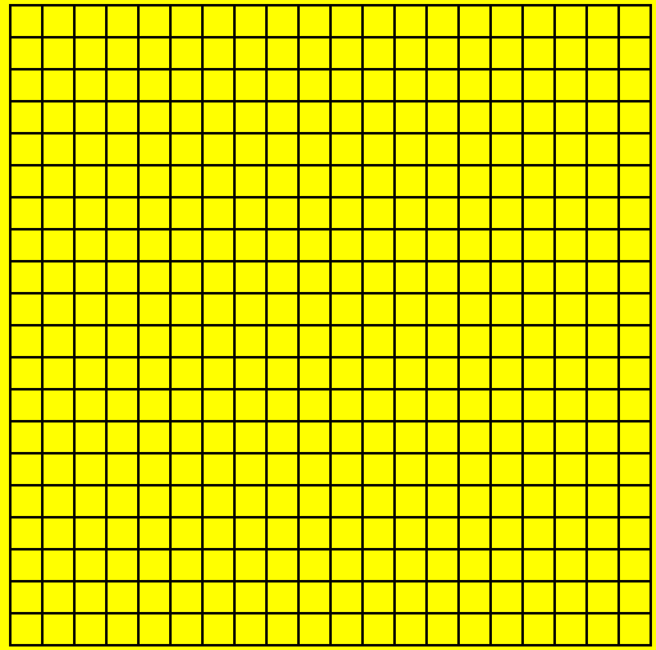
This is the general form equation of a hyperbola. We can tell this because the value of A, 9, is positive,



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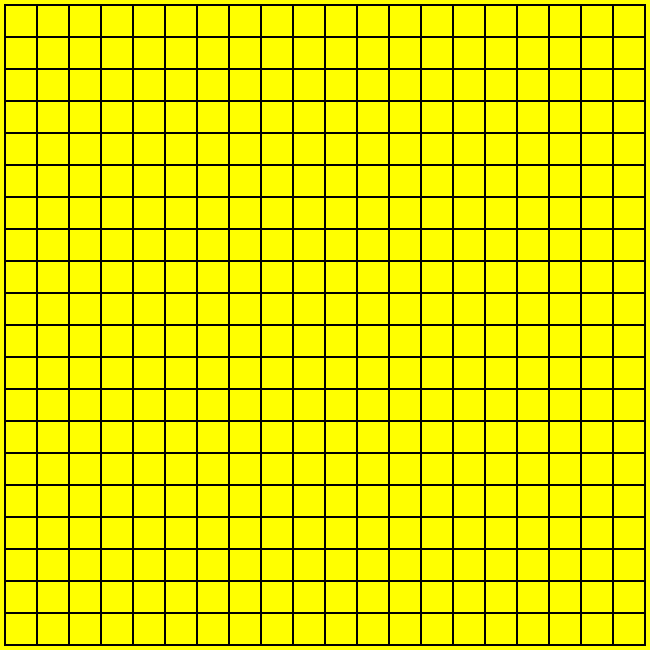

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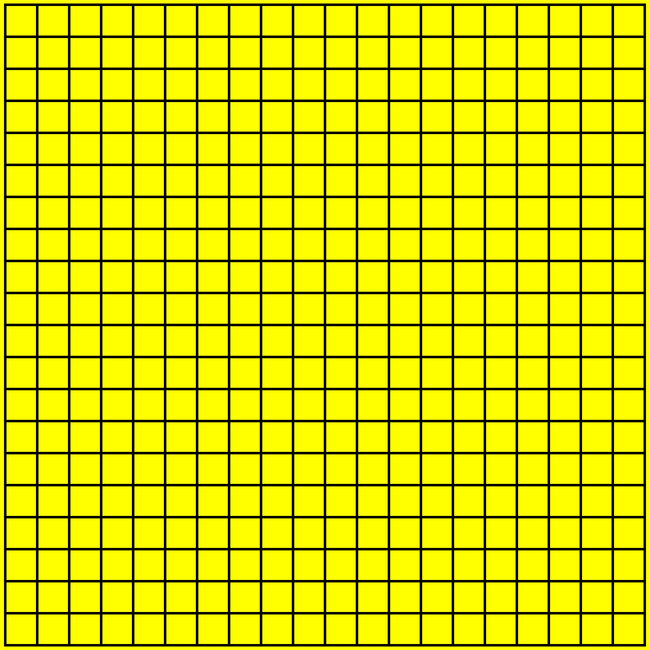

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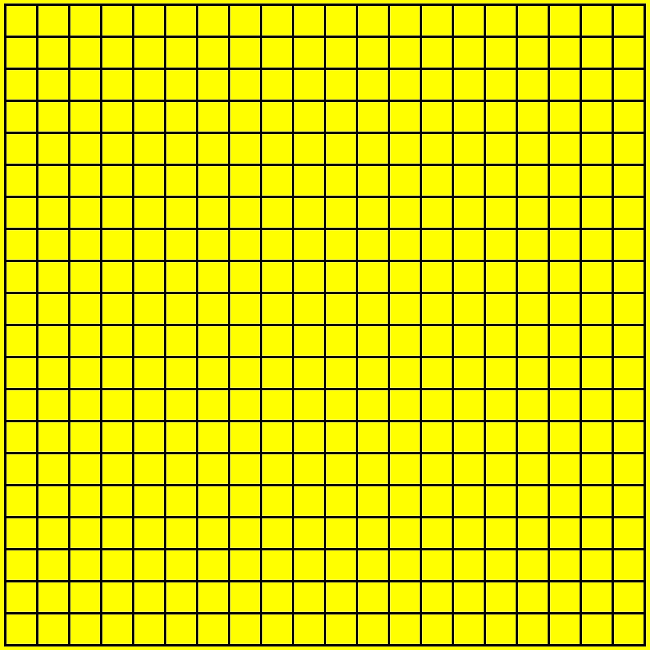

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Rearrange the terms in the equation.

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Rearrange the terms in the equation.
(Add 463 to each side.)

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Complete the square.

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Complete the square.

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

3. $9x^2 - 16y^2 + 54x + 160y - 463 = 0$

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Factor.

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$$9(x + 3)^2$$

Factor.

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$$9(x + 3)^2 - 16(y - 5)^2$$

Factor.

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$$9(x + 3)^2 - 16(y - 5)^2 = 144$$

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Express each equation using 'standard form' and sketch a graph.

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Express each equation using 'standard form' and sketch a graph.

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$$9(x^2 + 6x + 9) - 16(y^2 - 10y + 25) = 463 + 81 - 400$$

$$9(x + 3)^2 - 16(y - 5)^2 = 144$$

Divide both sides by 144.

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

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$$\frac{9(x + 3)^2}{144} - \frac{16(y - 5)^2}{144} = \frac{144}{144}$$

Divide both sides by 144.

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Reduce to lowest terms.

Class Worksheet #3

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$$\frac{(x + 3)^2}{16}$$

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Standard Form Equation

$$\frac{(x+3)^2}{16} - \frac{(y-5)^2}{9} = 1$$

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This a type 1 Hyperbola.

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Standard Form Equation

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This a type 1 Hyperbola.

Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

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$h = -3$

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$h = -3$ and $k = 5$

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This a type 1 Hyperbola.

$h = -3$ and $k = 5$ → Center:

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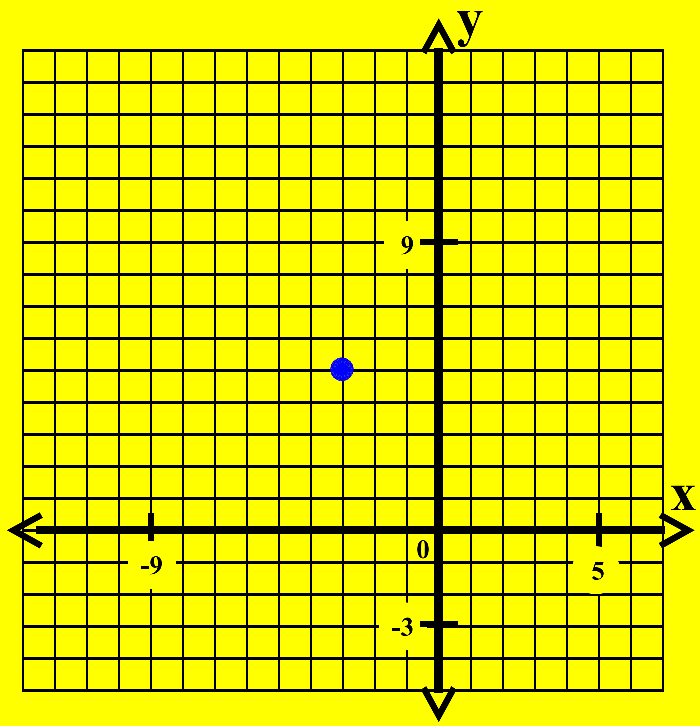

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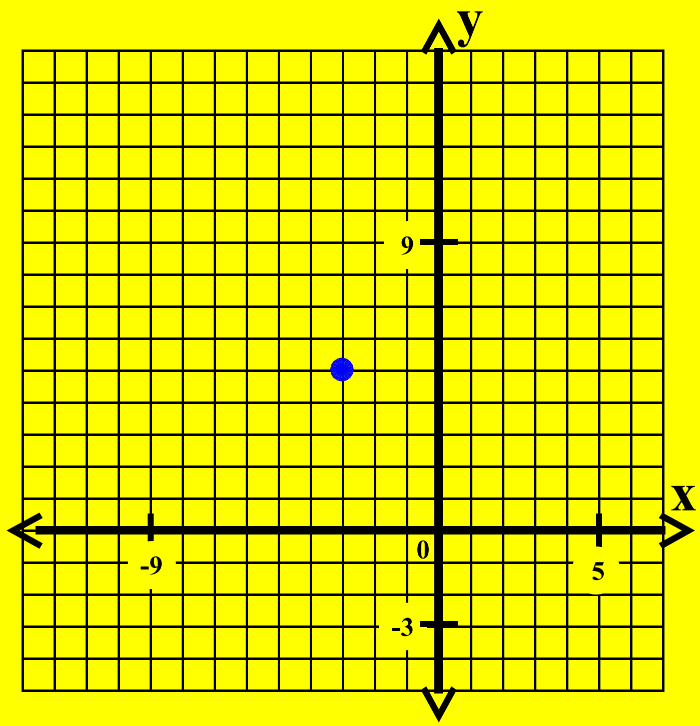

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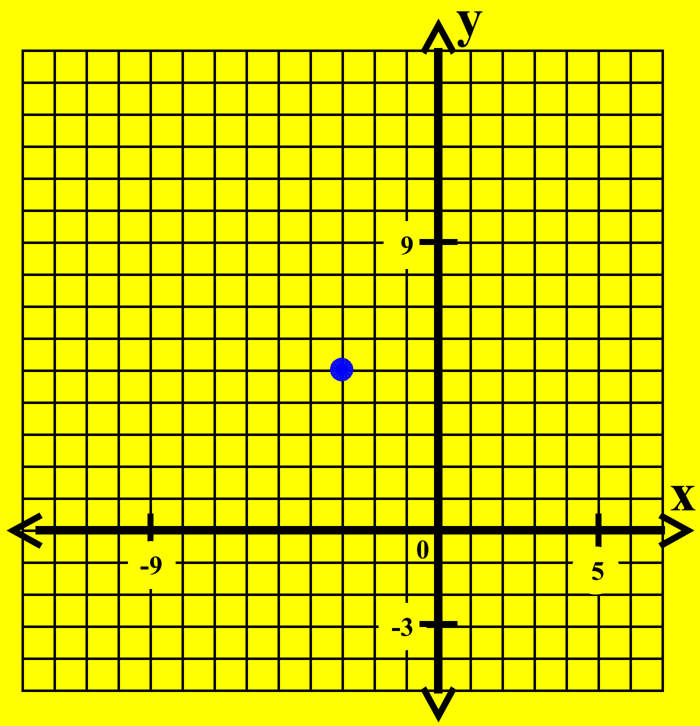
a^2



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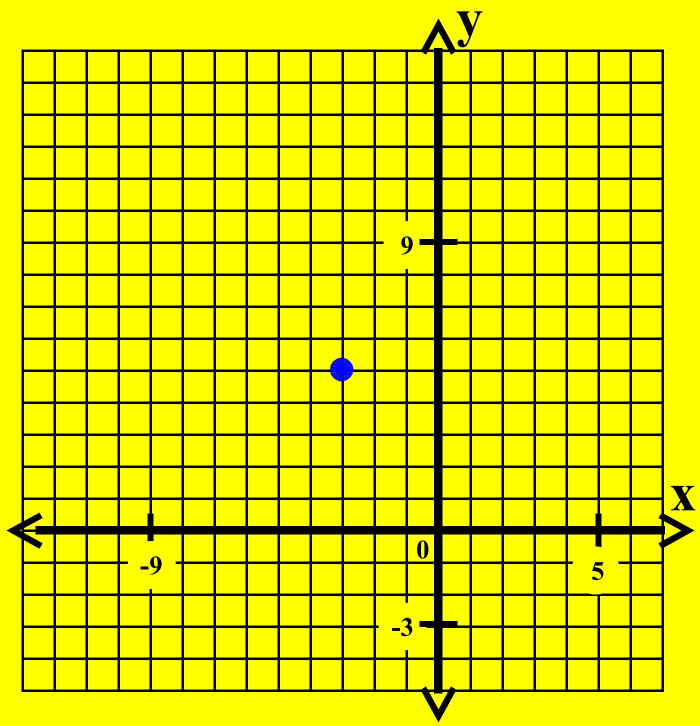

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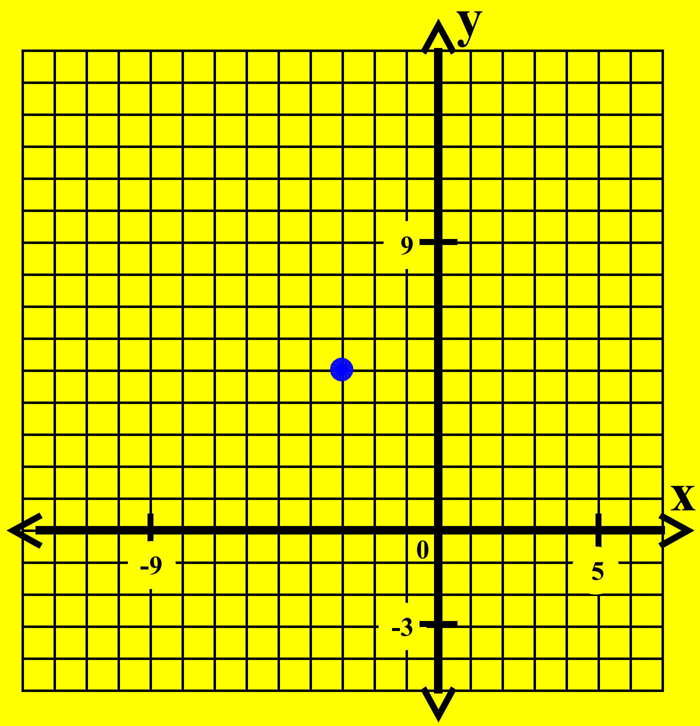
$a^2 = 16$



Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

3. $9x^2 - 16y^2 + 54x + 160y - 463 = 0$

Standard Form Equation

$$\frac{(x+3)^2}{16} - \frac{(y-5)^2}{9} = 1$$

This a type 1 Hyperbola.

$h = -3$ and $k = 5$ → Center: $(-3, 5)$

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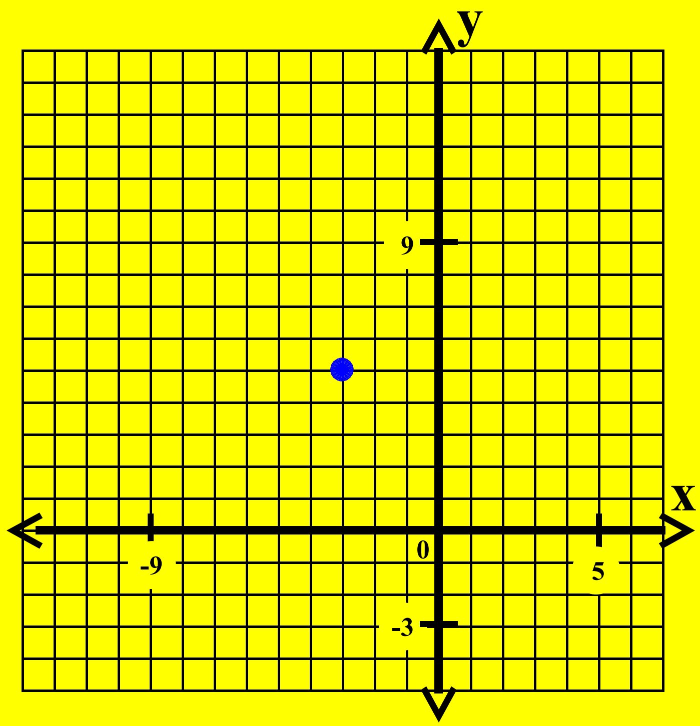

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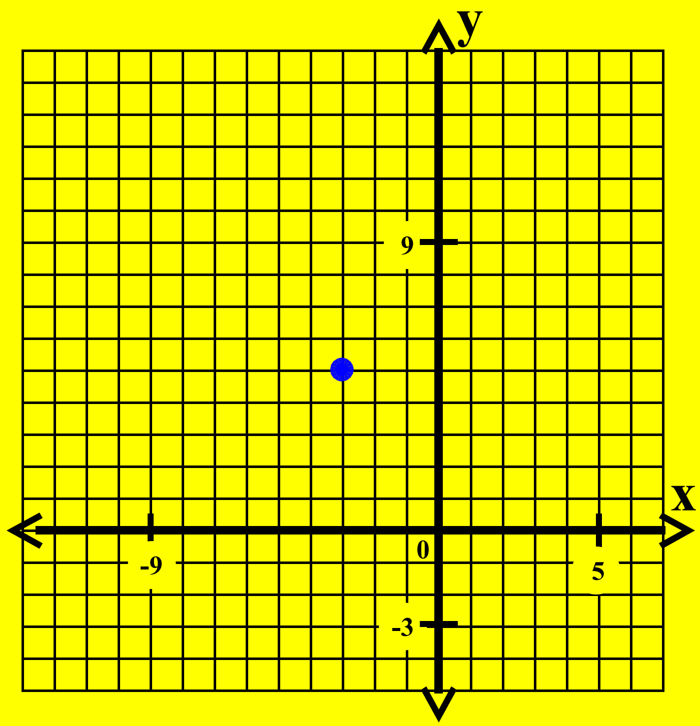

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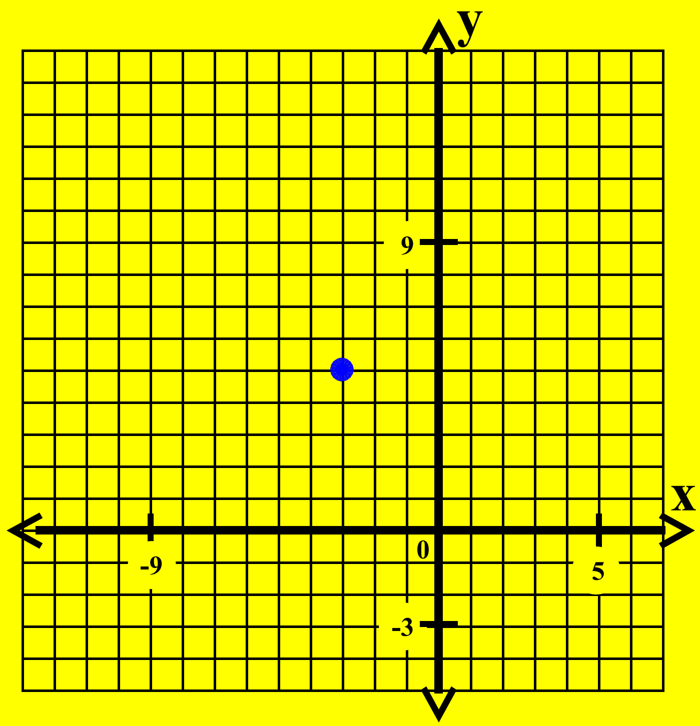

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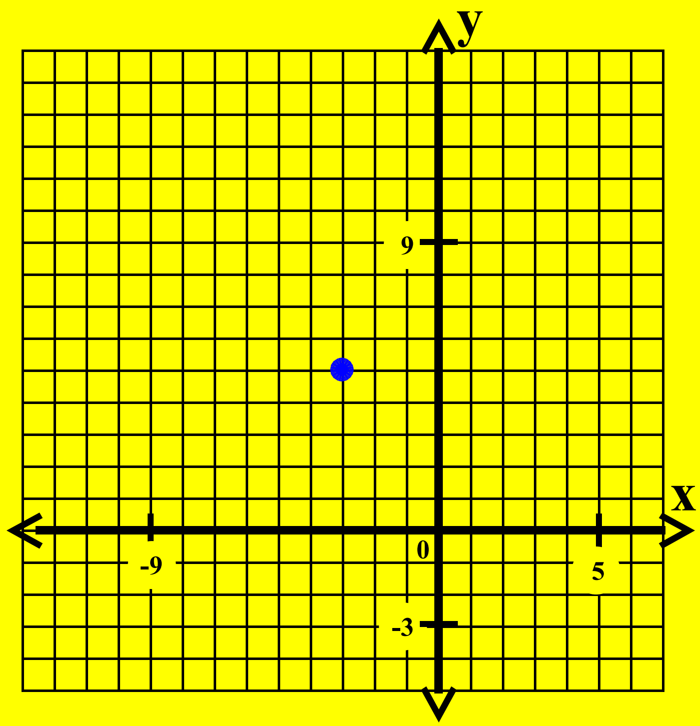

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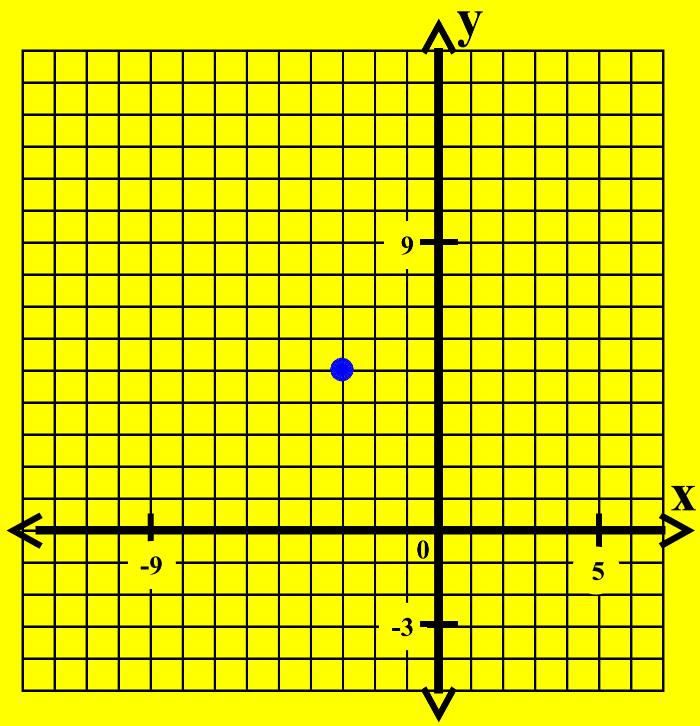

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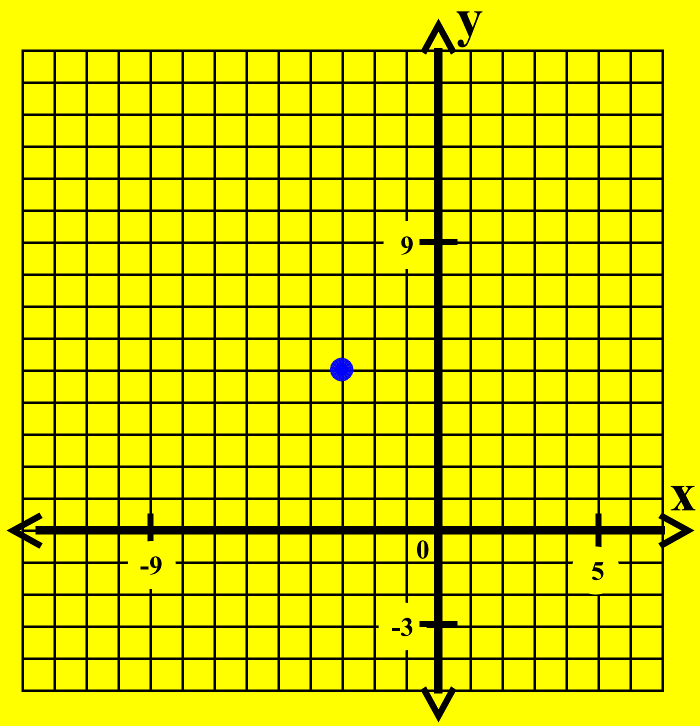

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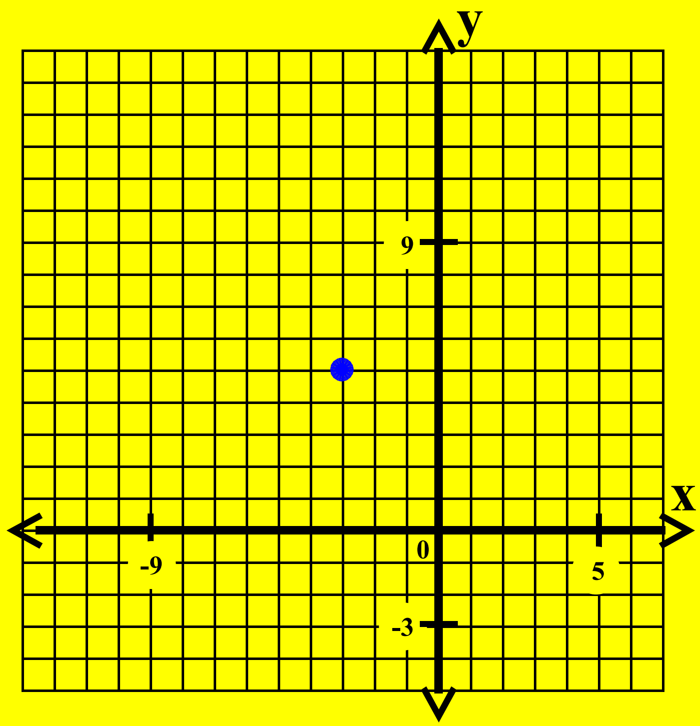

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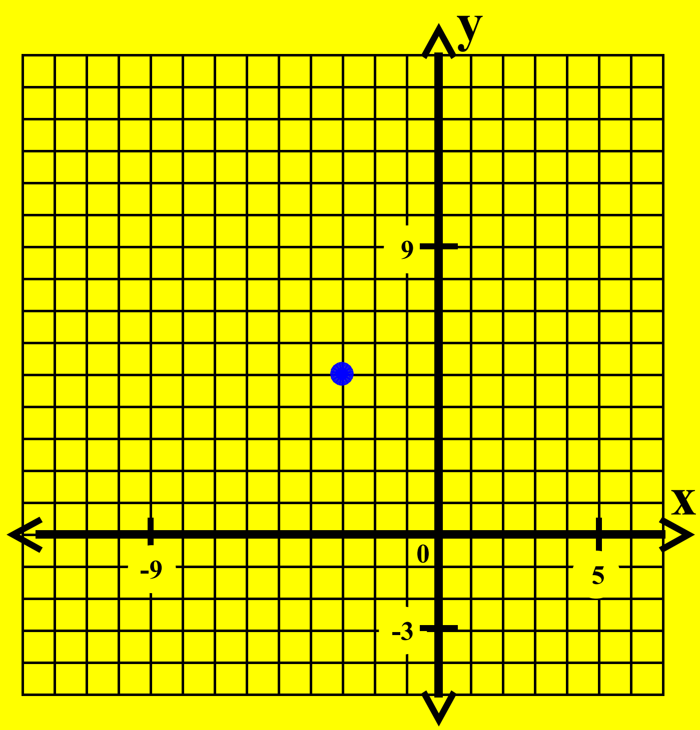

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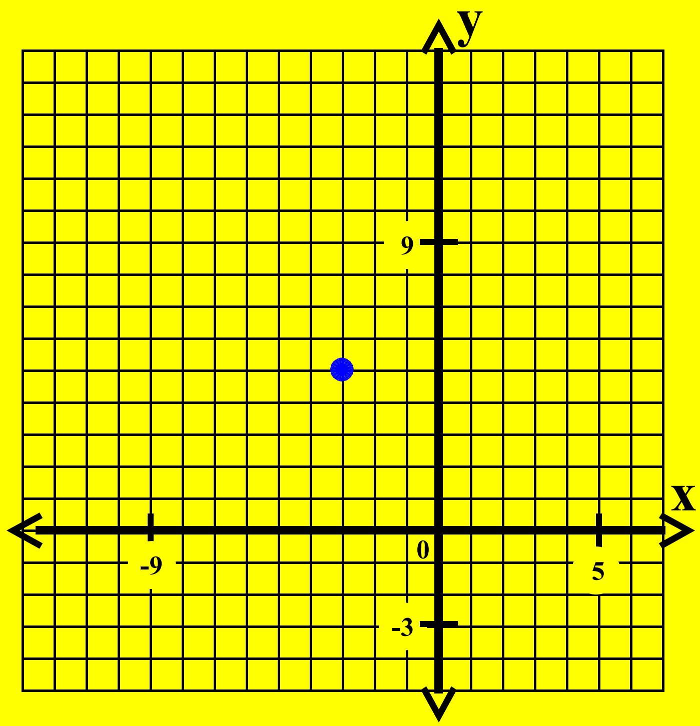

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$h = -3$ and $k = 5$ ⇨ Center: $(-3, 5)$

$a^2 = 16$ and $b^2 = 9$ ⇨ $a = 4$

Standard Form Equation

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

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Express each equation using 'standard form' and sketch a graph.

3. $9x^2 - 16y^2 + 54x + 160y - 463 = 0$

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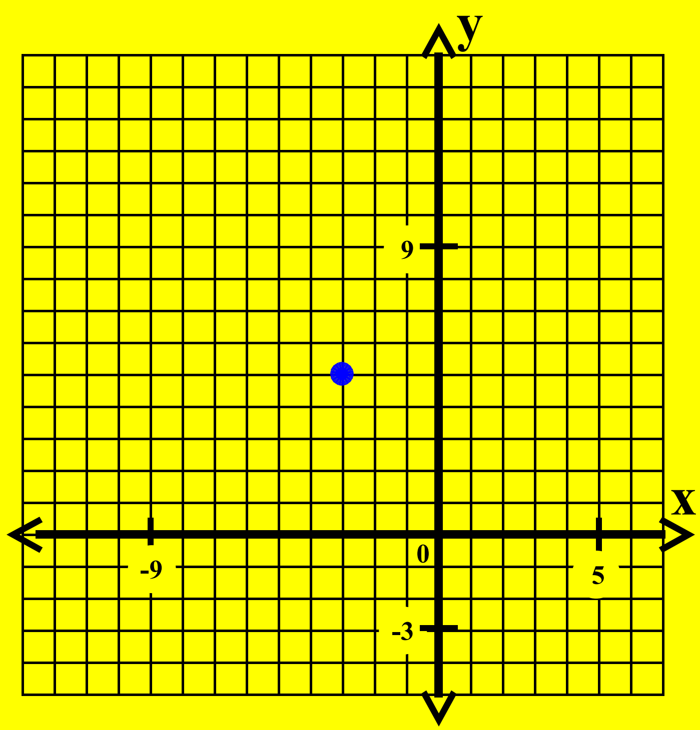

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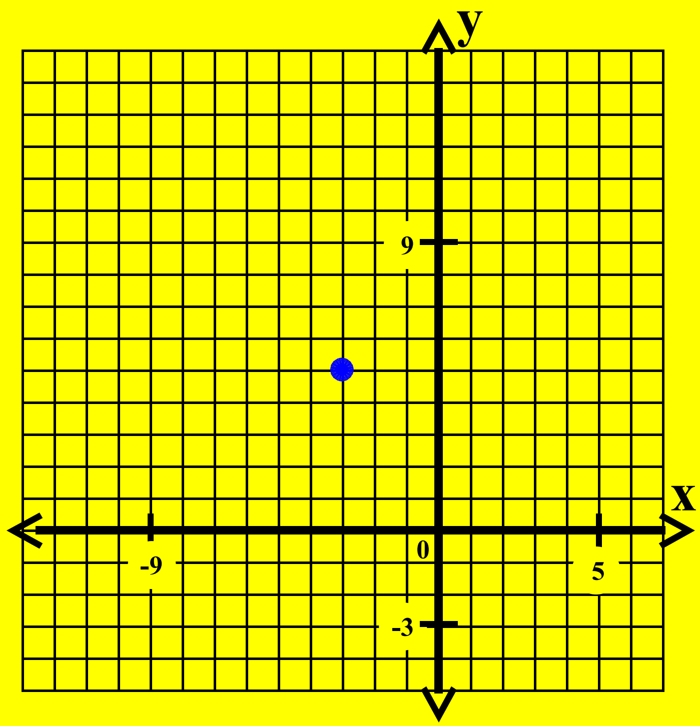

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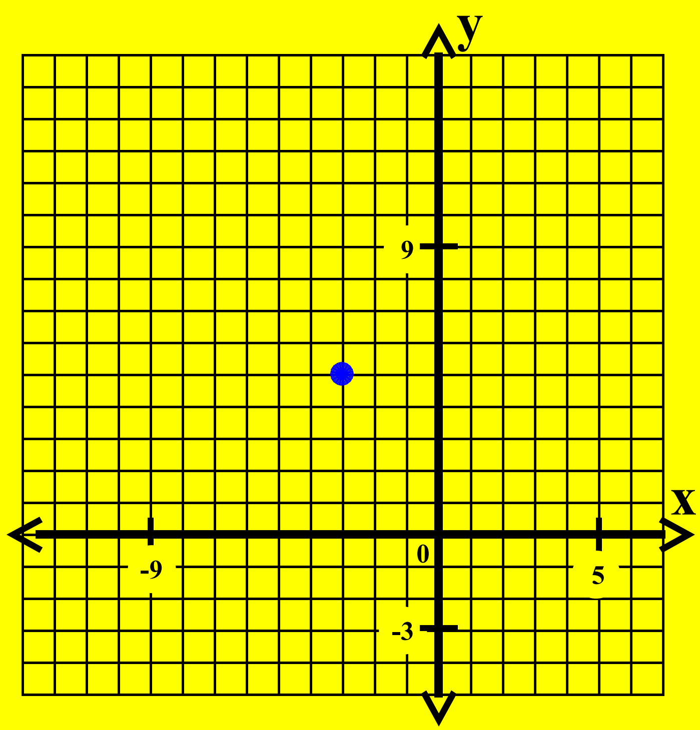

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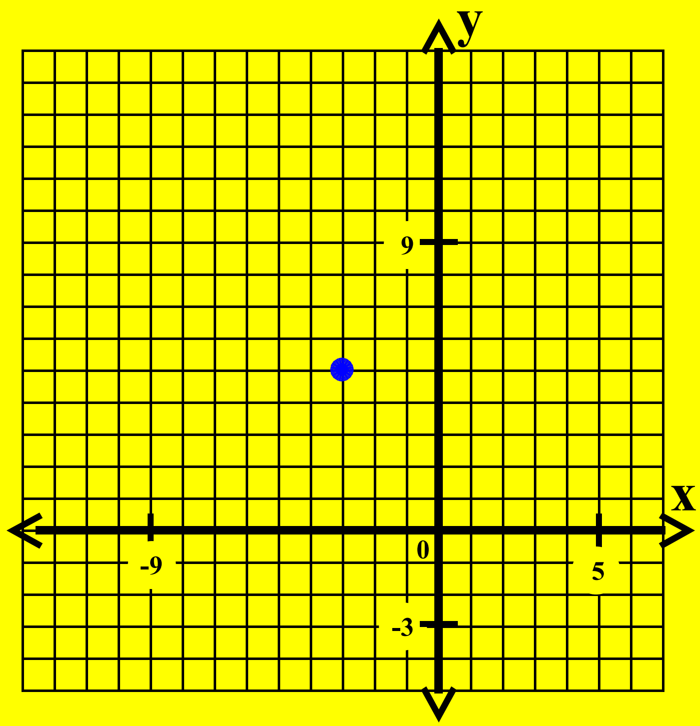

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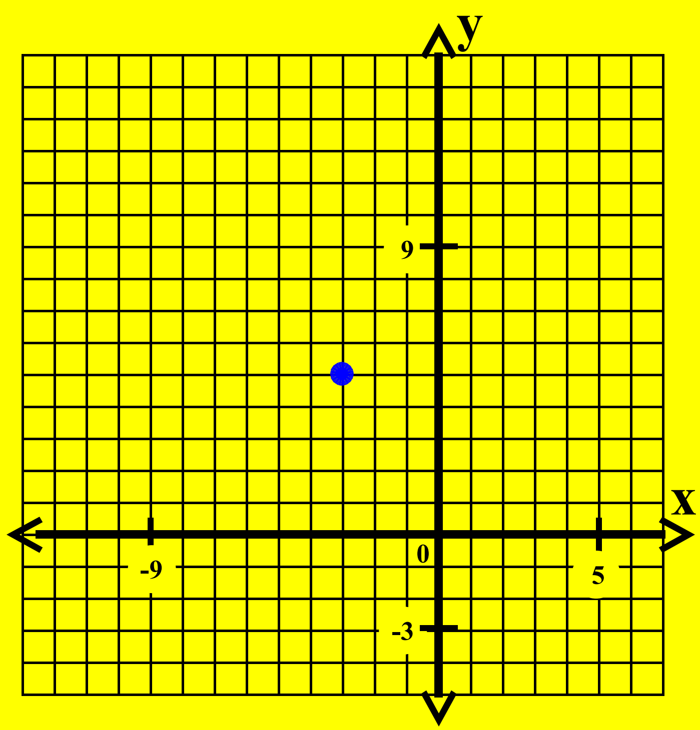
The transverse axis is $2a = 8$ units long.



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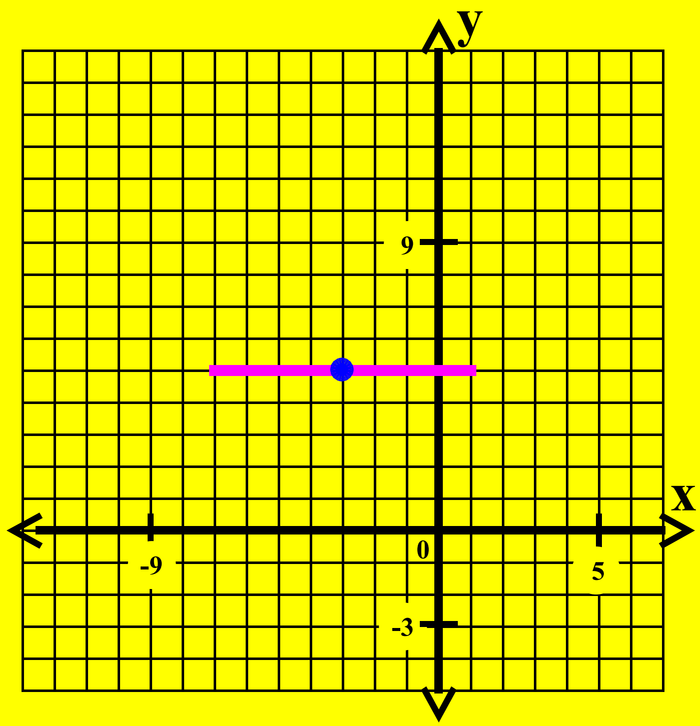

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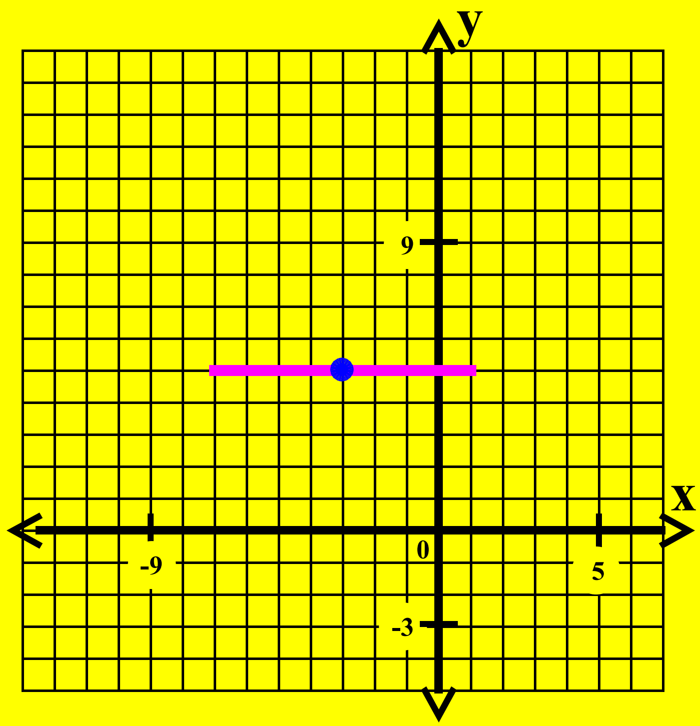

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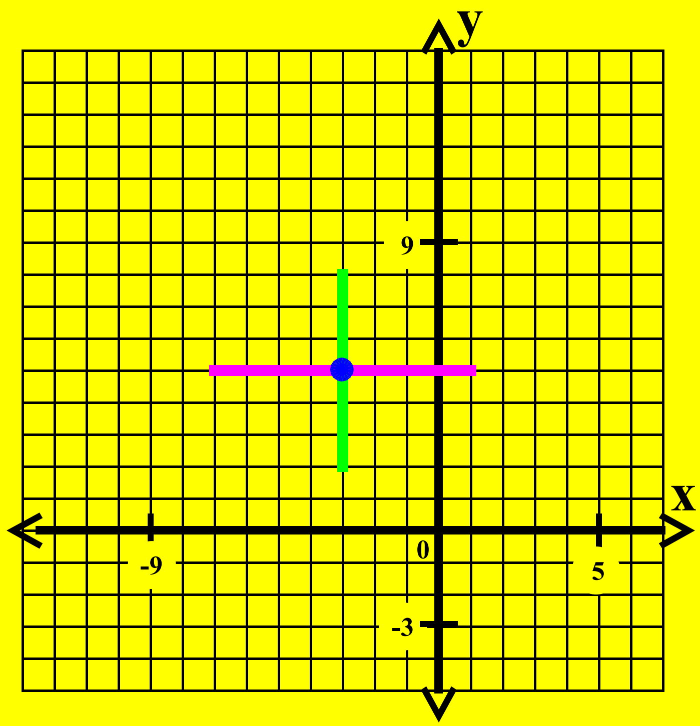

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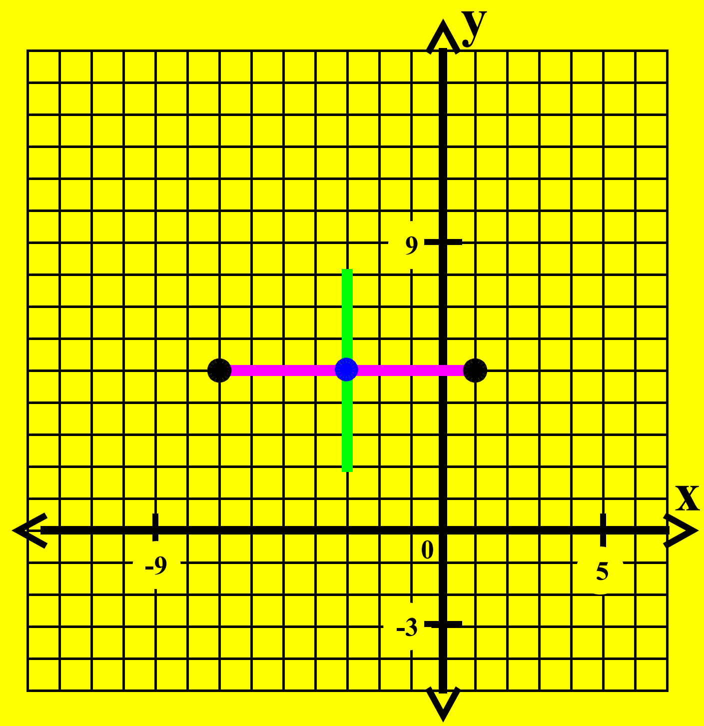
Each endpoint of the transverse axis



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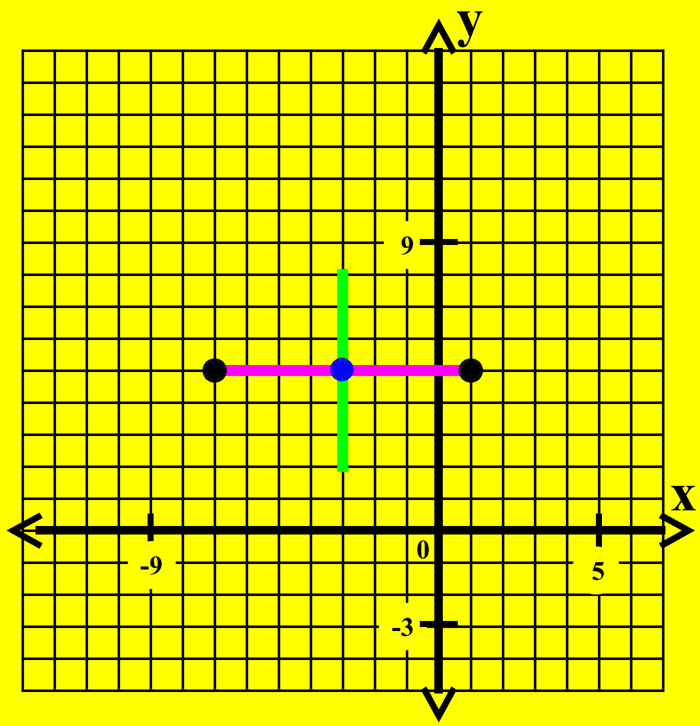

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The transverse axis is $2a = 8$ units long.

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Each endpoint of the transverse axis is a vertex of the hyperbola.

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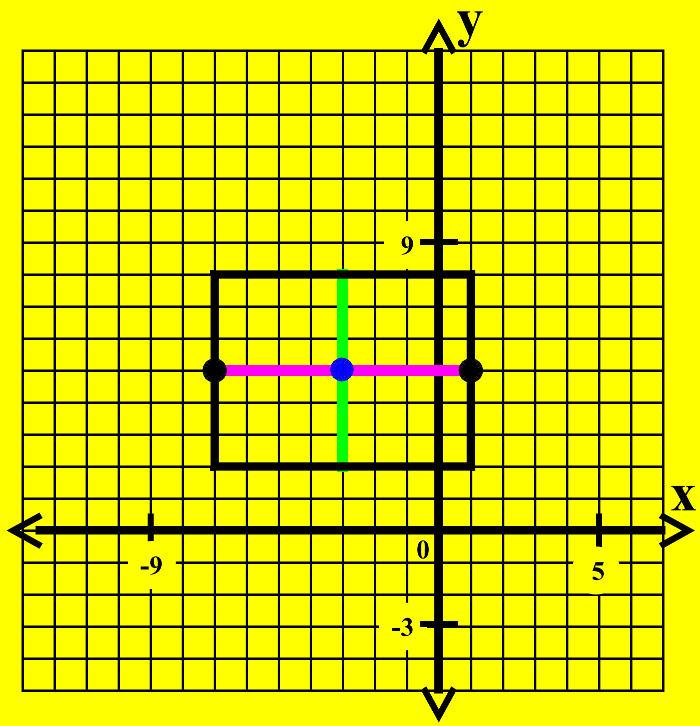

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The diagonals of this rectangle

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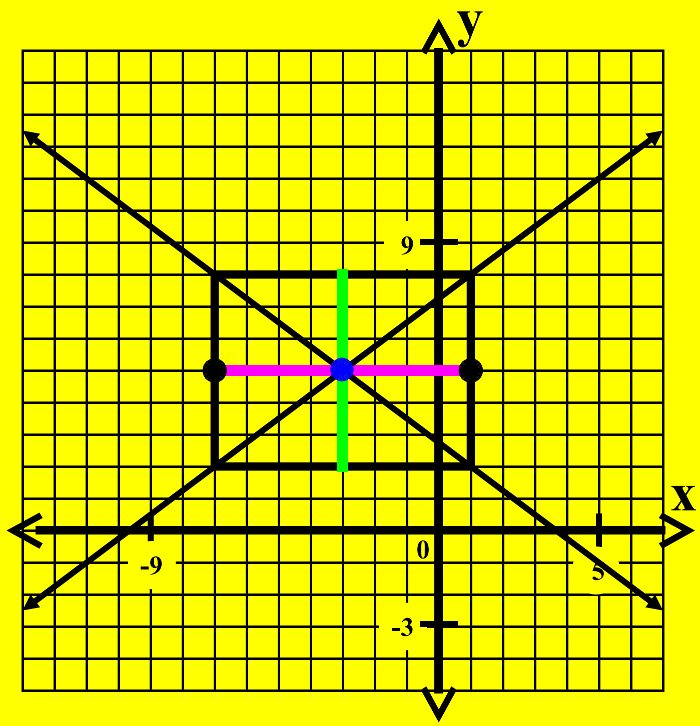

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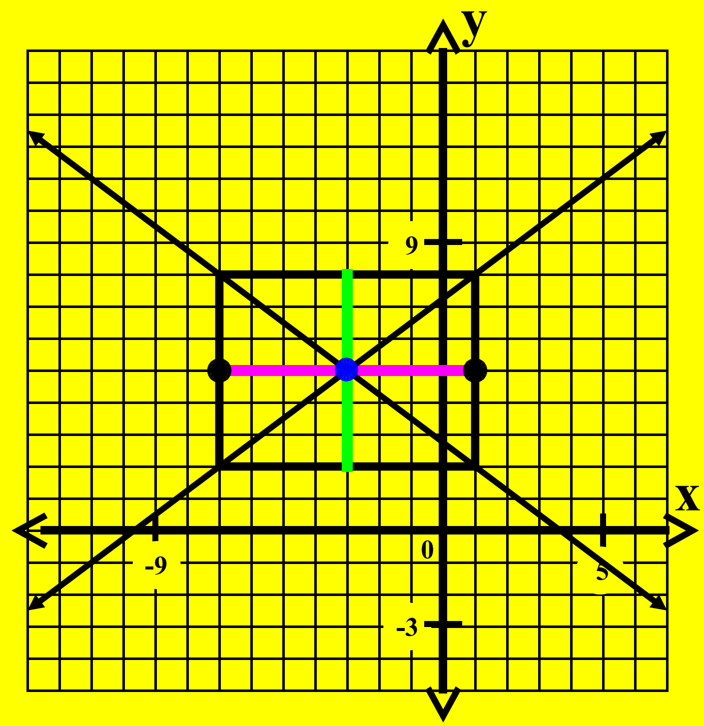

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The diagonals of this rectangle determine the asymptotes of the hyperbola.

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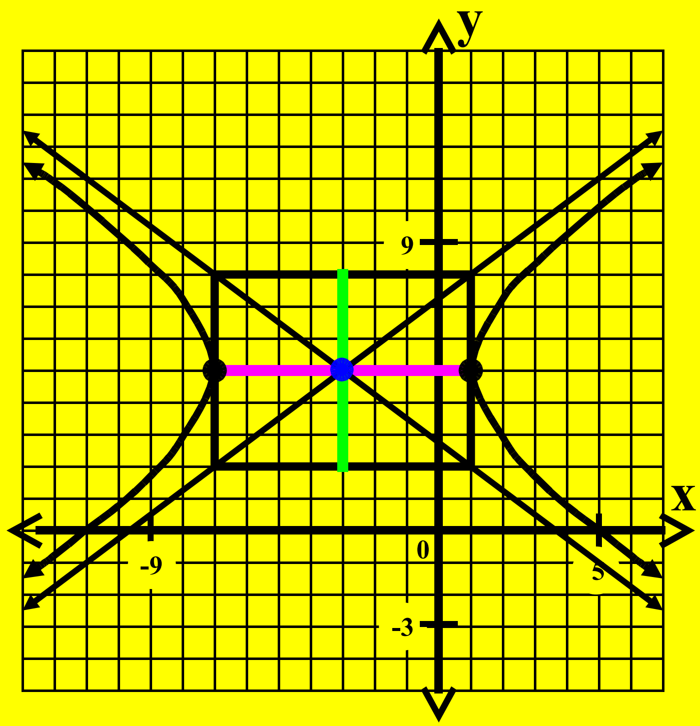

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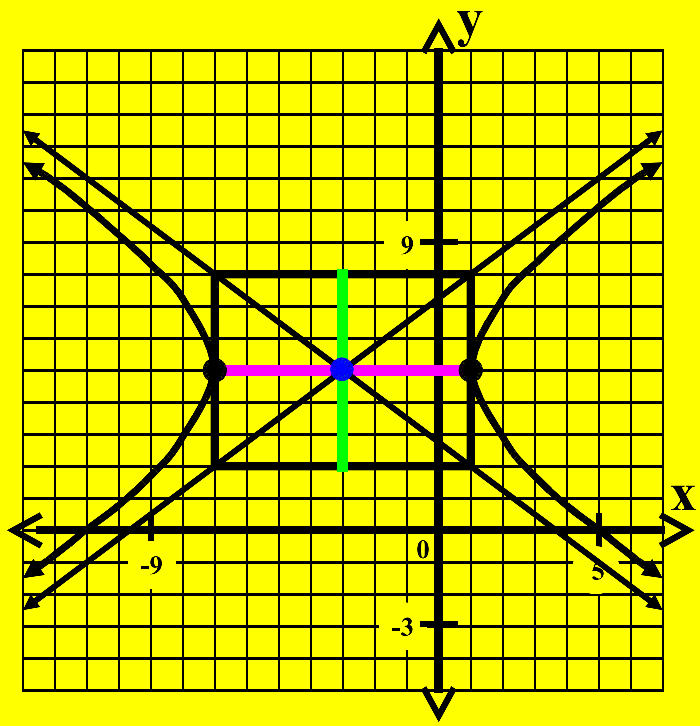

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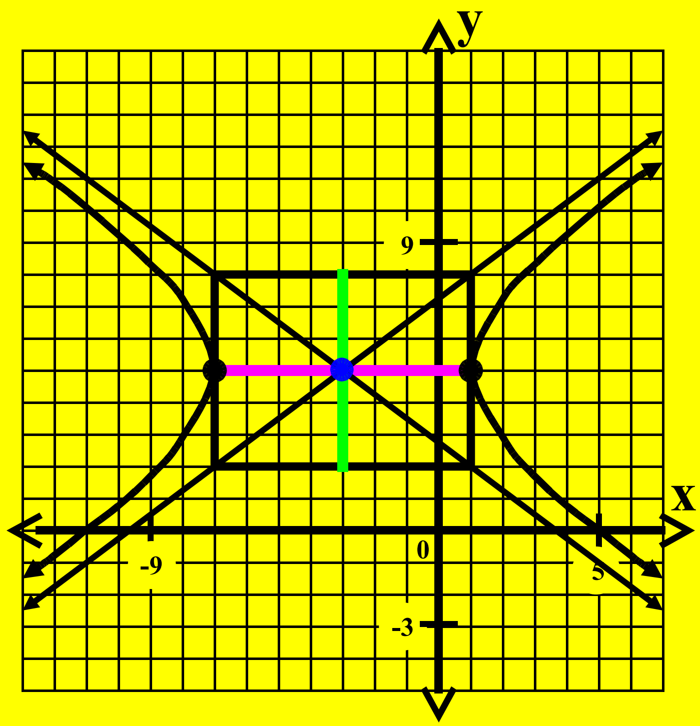

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Each focus is c units from the center

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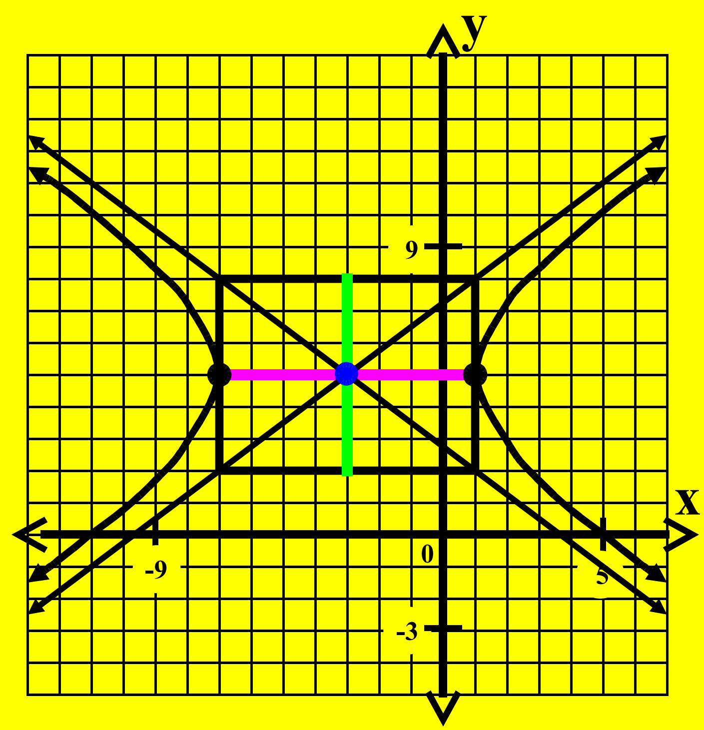
Each focus is c units from the center where $c^2 = a^2 + b^2$.



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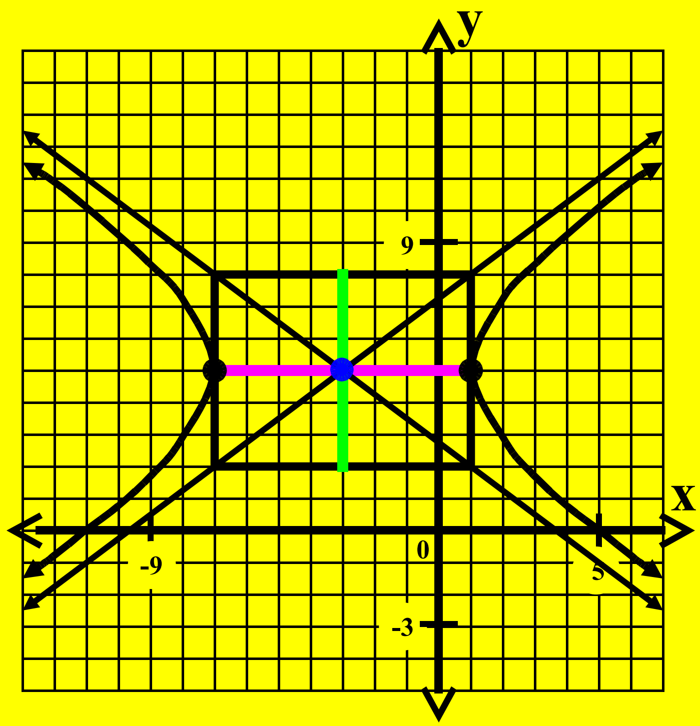

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$c^2 =$

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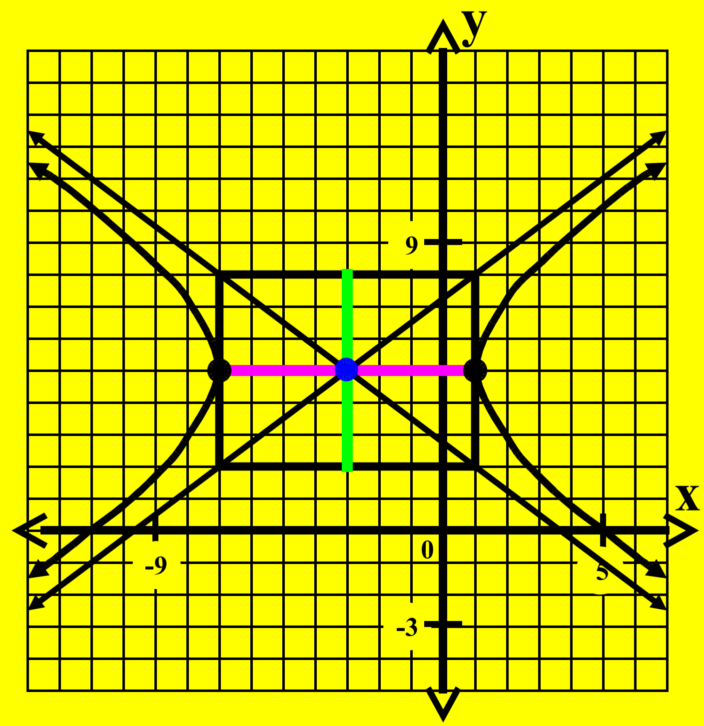

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$c^2 = 16$

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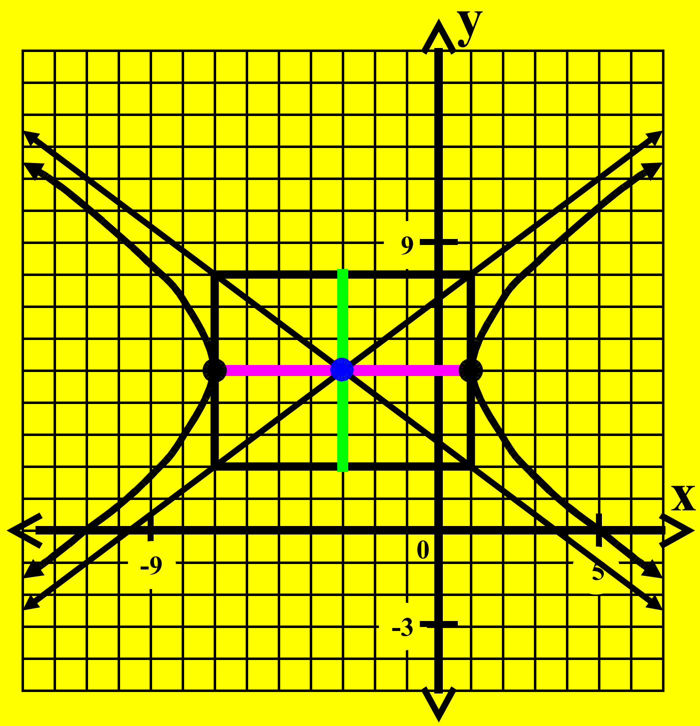

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$a^2 = 16$ and $b^2 = 9$ ⇨ $a = 4$ and $b = 3$

Each focus is c units from the center where $c^2 = a^2 + b^2$.

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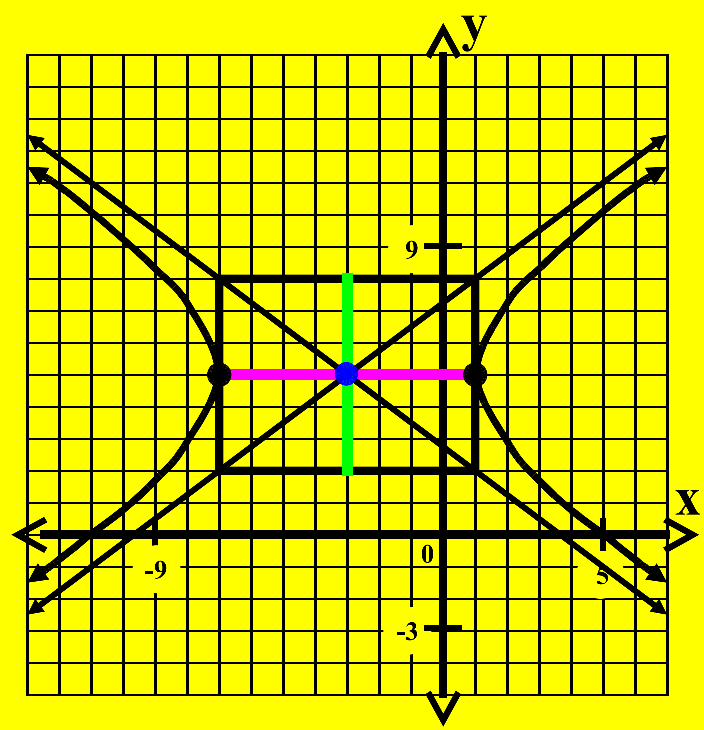
Express each equation using 'standard form' and sketch a graph.

3. $9x^2 - 16y^2 + 54x + 160y - 463 = 0$



Standard Form Equation

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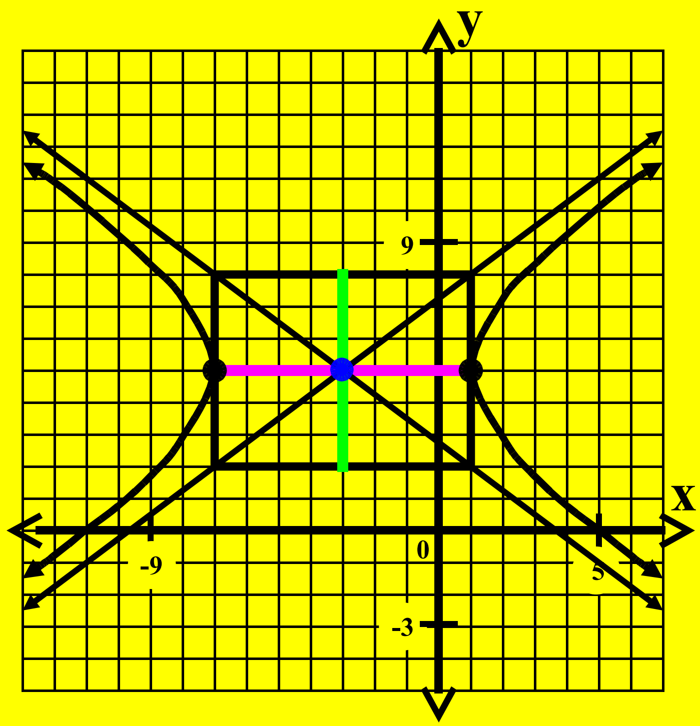

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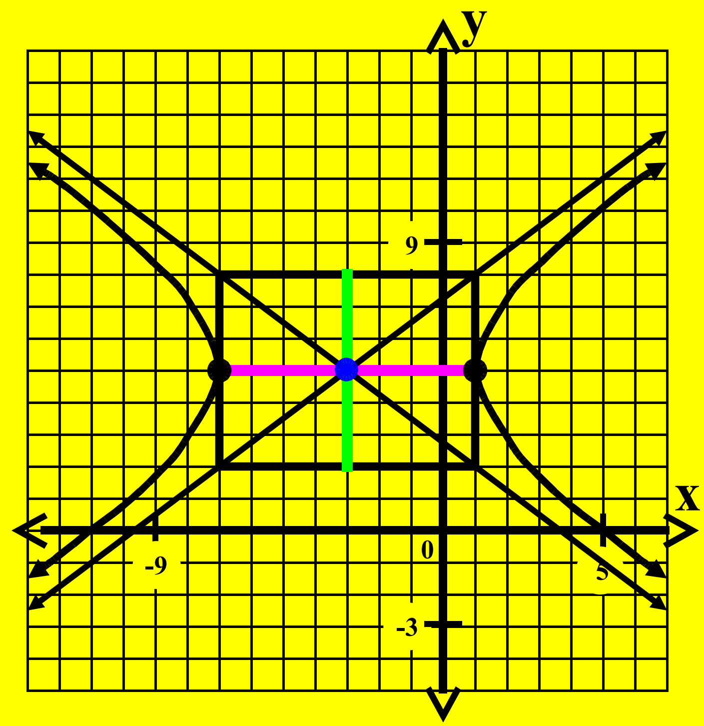

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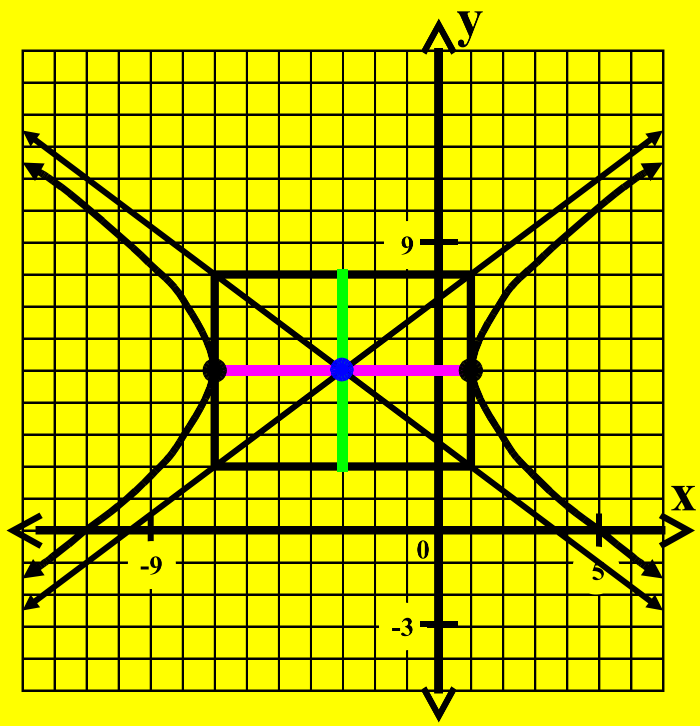

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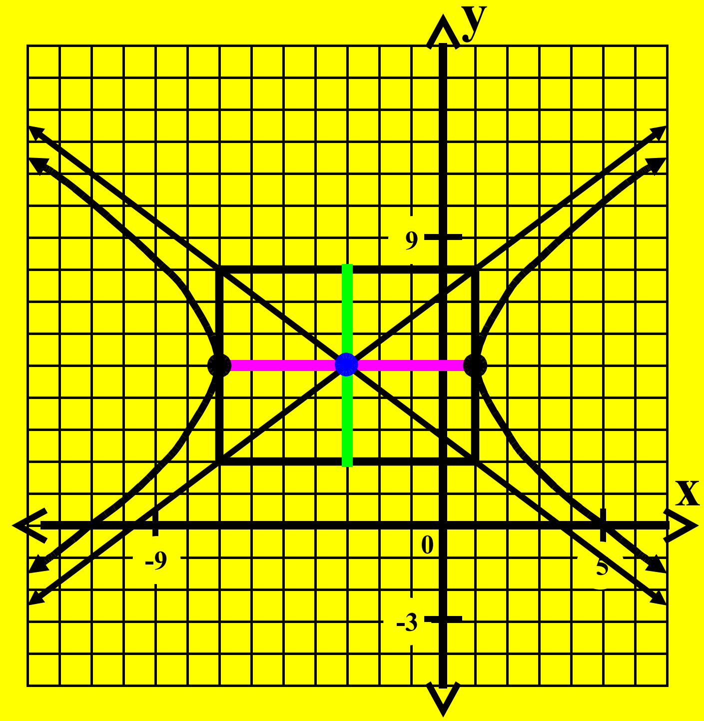

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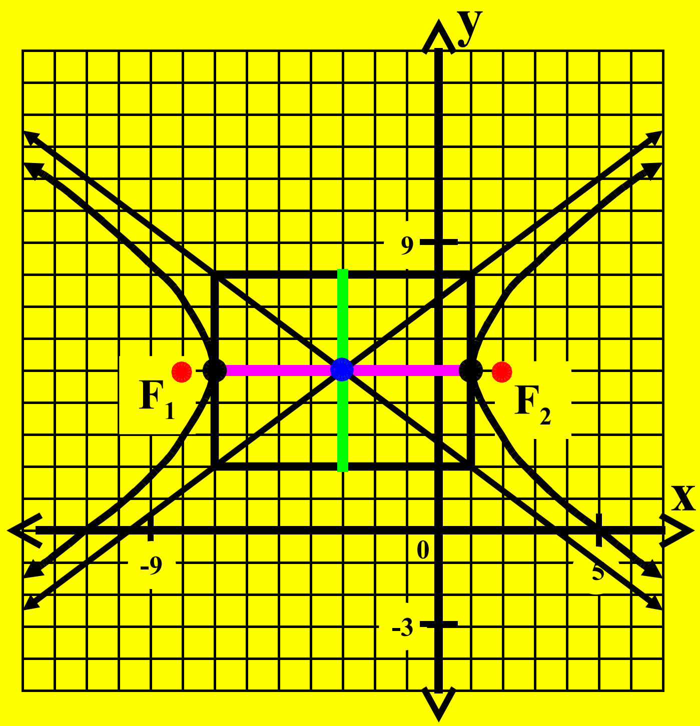

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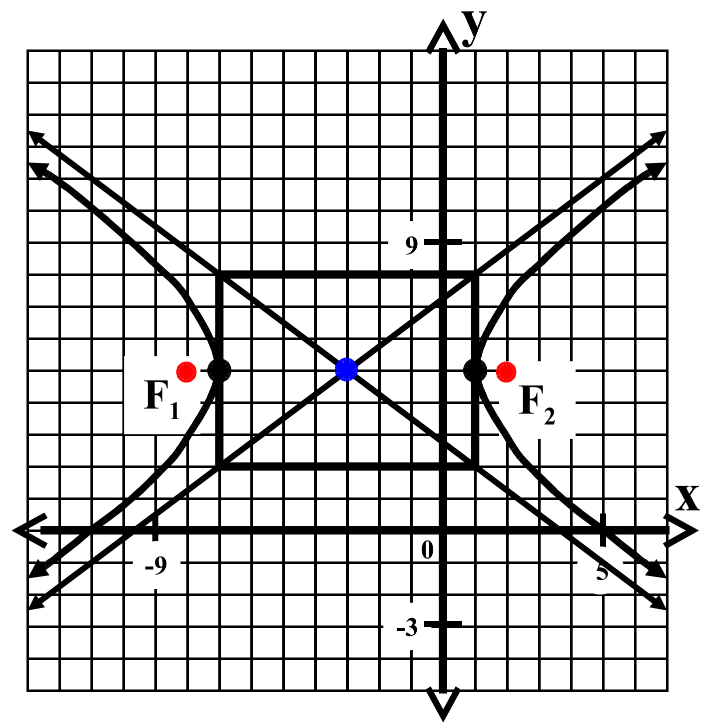

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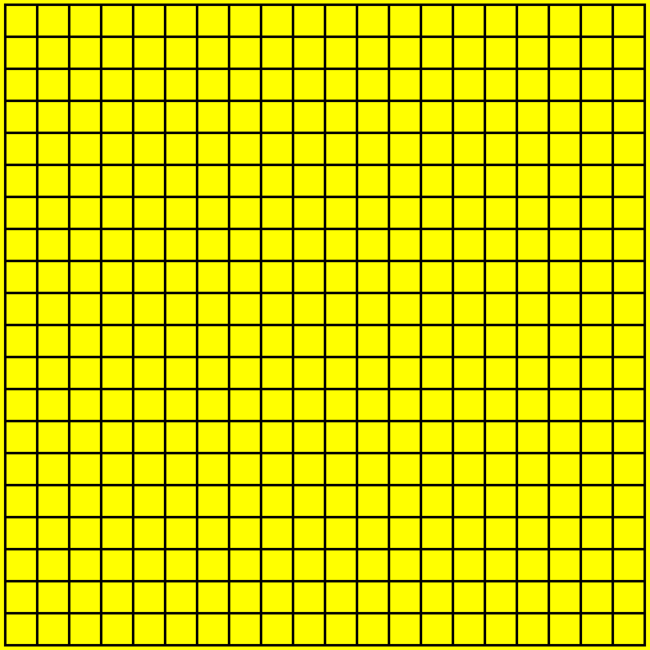

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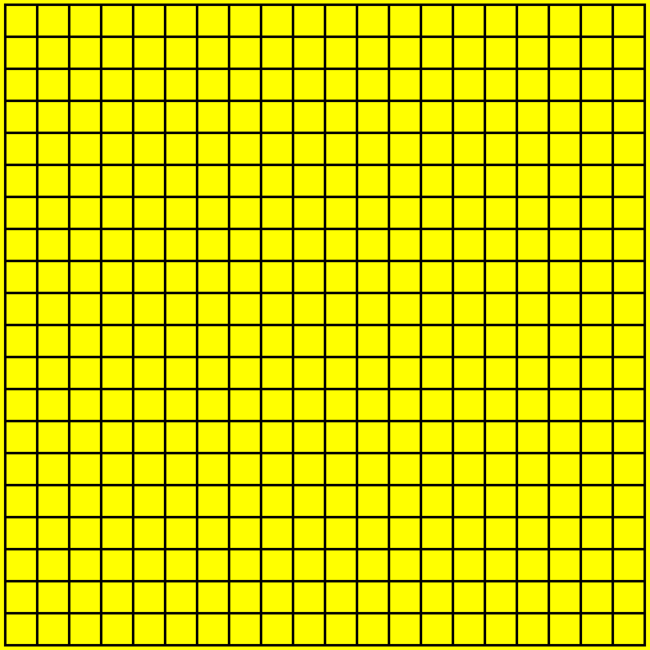

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General Form Equation

$Ax^2 + Cy^2 + Dx + Ey + F = 0$

$AC < 0$

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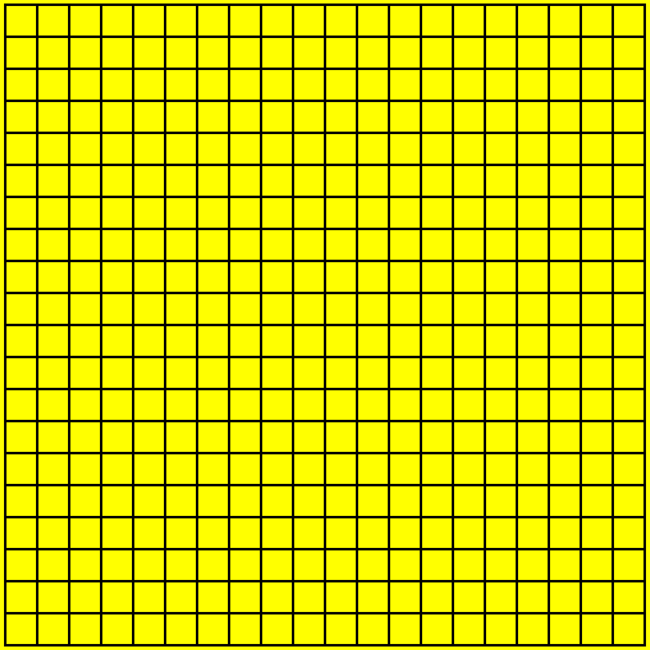

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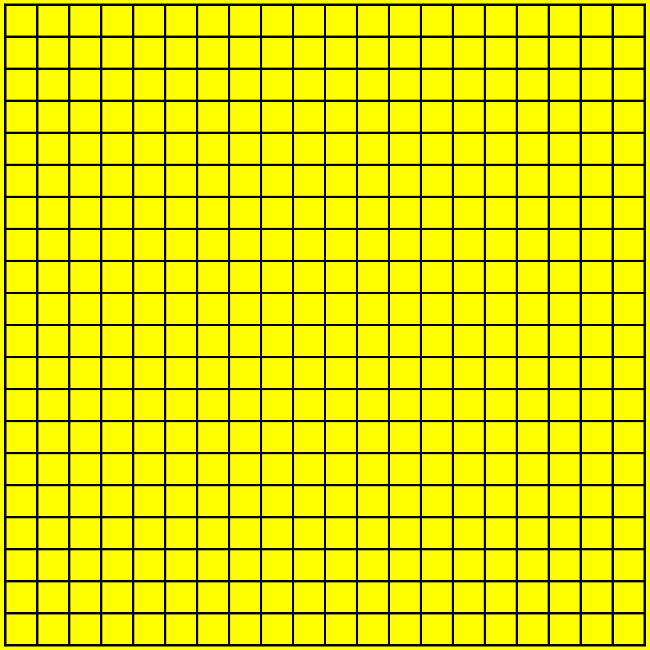

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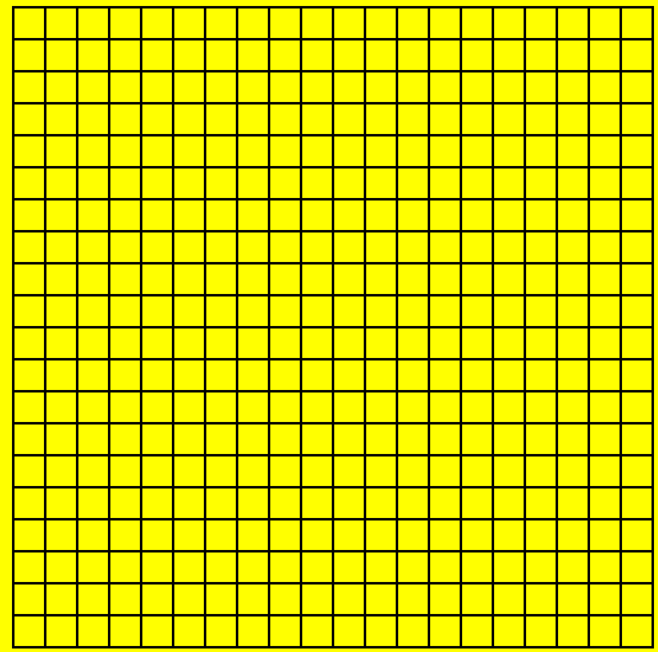

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$$9(x + 2)^2 -$$

Factor.

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

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Divide both sides by -144.

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Reduce to lowest terms.

Class Worksheet #3

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$$\frac{-1(x+2)^2}{16}$$

Reduce to lowest terms.

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$$\frac{-1(x+2)^2}{16} + \frac{(y+1)^2}{9}$$

Reduce to lowest terms.

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$$-\frac{1(x + 2)^2}{16} + \frac{(y + 1)^2}{9} = 1$$

Reduce to lowest terms.

Class Worksheet #3

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Class Worksheet #3

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$$\frac{-1(x+2)^2}{16} + \frac{(y+1)^2}{9} = 1$$

Reorder the terms of the equation.

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

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$$\frac{-1(x+2)^2}{16} + \frac{(y+1)^2}{9} = 1$$

$$\frac{(y+1)^2}{9}$$

Reorder the terms of the equation.

Class Worksheet #3

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Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

4. $9x^2 - 16y^2 + 36x - 32y + 164 = 0$

Standard Form Equation

$$\frac{(y+1)^2}{9} - \frac{(x+2)^2}{16} = 1$$

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This a type 2 Hyperbola.

Class Worksheet #3

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Standard Form Equation

$$\frac{(y+1)^2}{9} - \frac{(x+2)^2}{16} = 1$$

This a type 2 Hyperbola.

Standard Form Equation

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

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Standard Form Equation

$$\frac{(y+1)^2}{9} - \frac{(x+2)^2}{16} = 1$$

This a type 2 Hyperbola.

$h = -2$

Standard Form Equation

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Class Worksheet #3

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This a type 2 Hyperbola.

$h = -2$ and $k = -1$

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$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

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$h = -2$ and $k = -1$ ⇨ Center:

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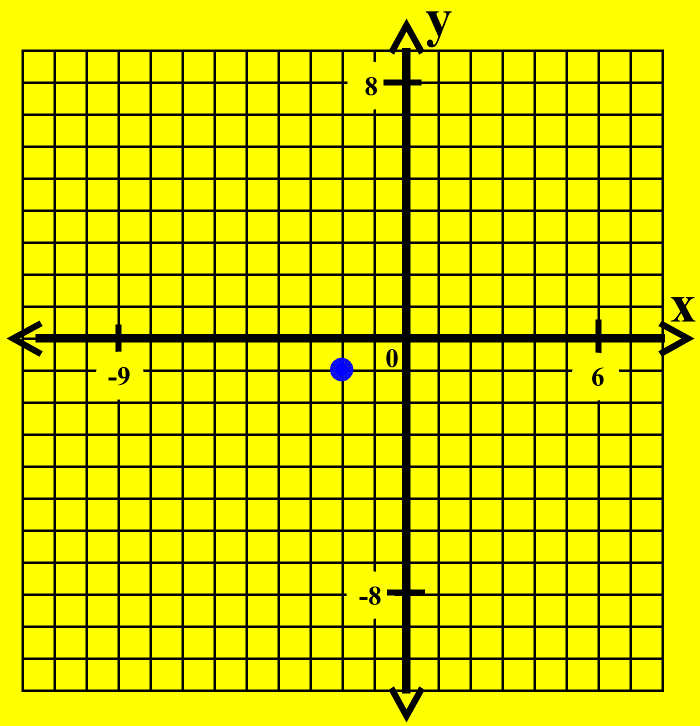

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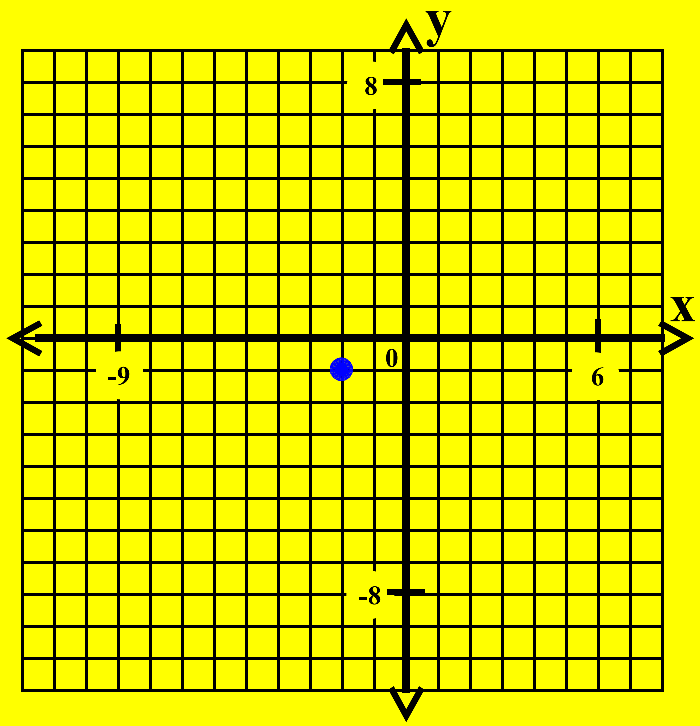

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$a^2 =$

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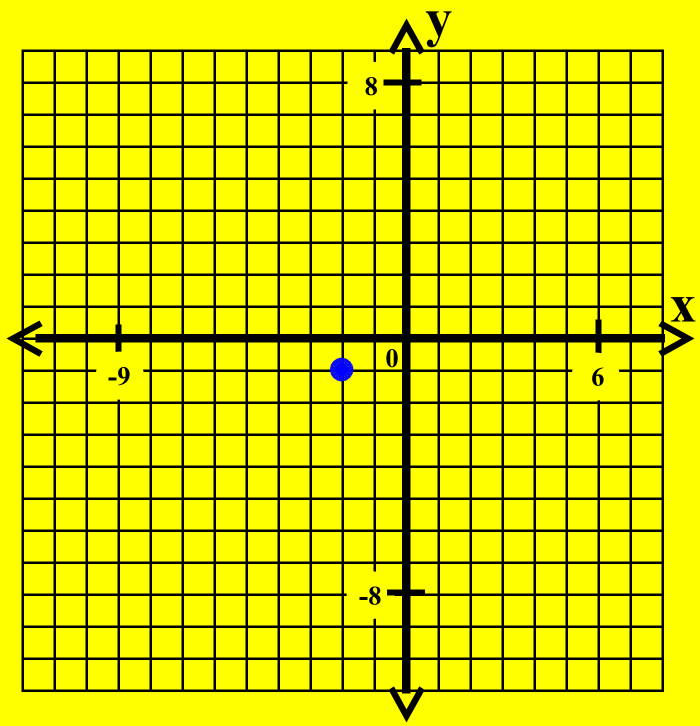

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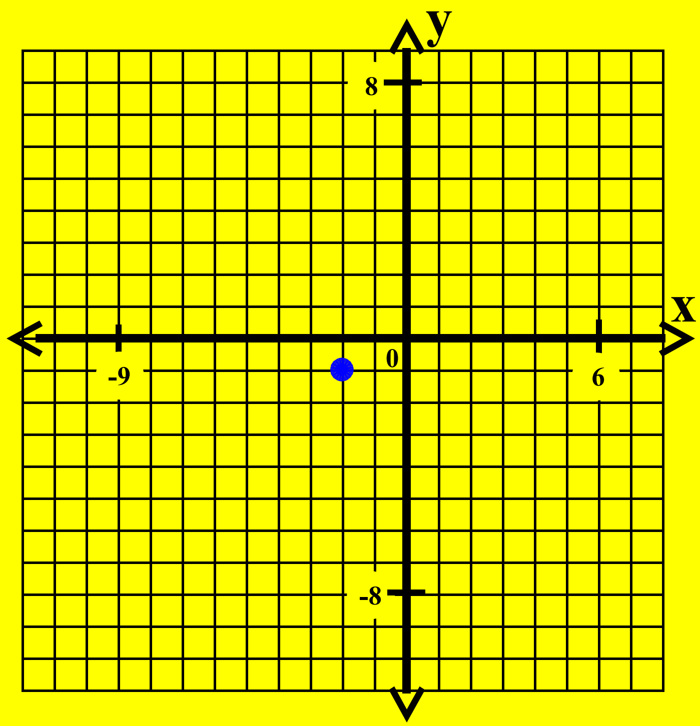

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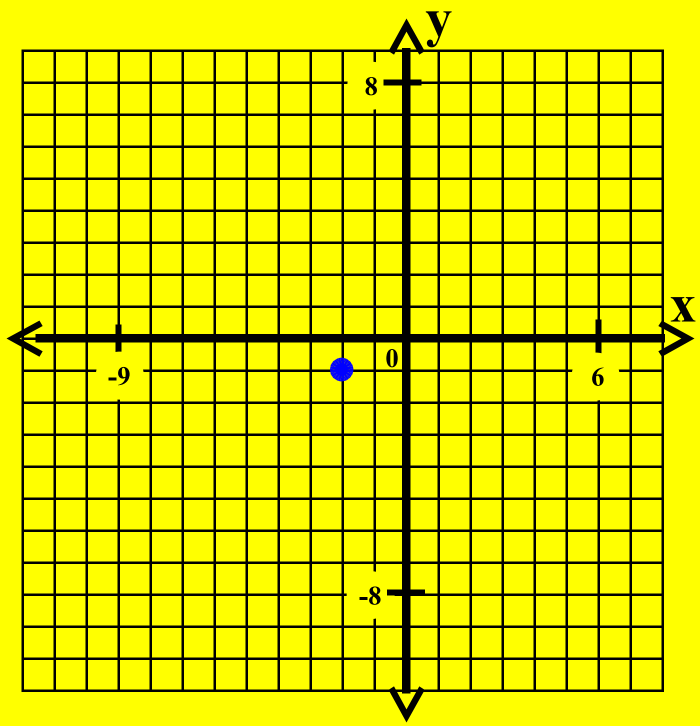

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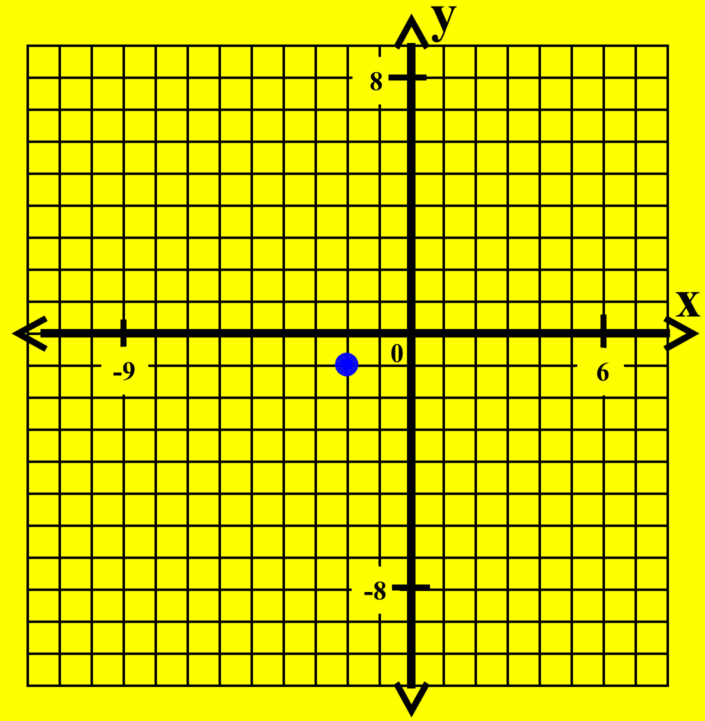

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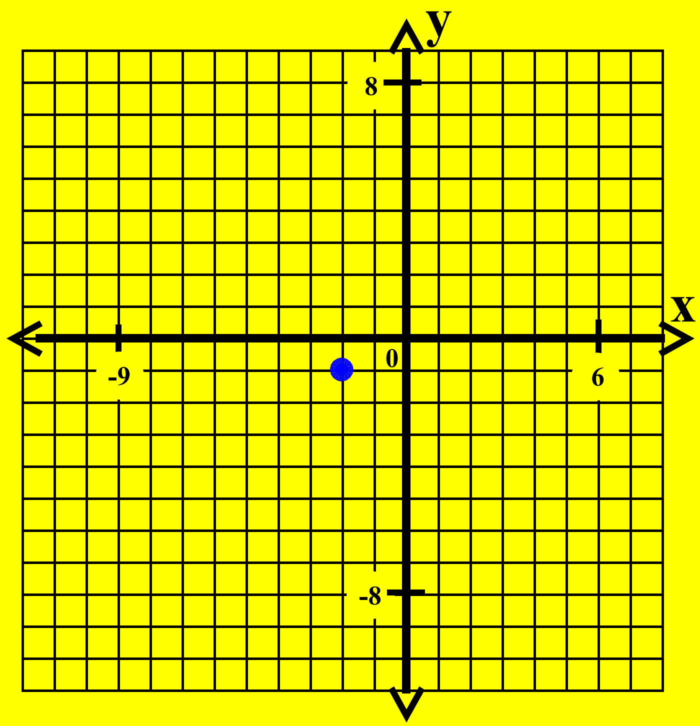

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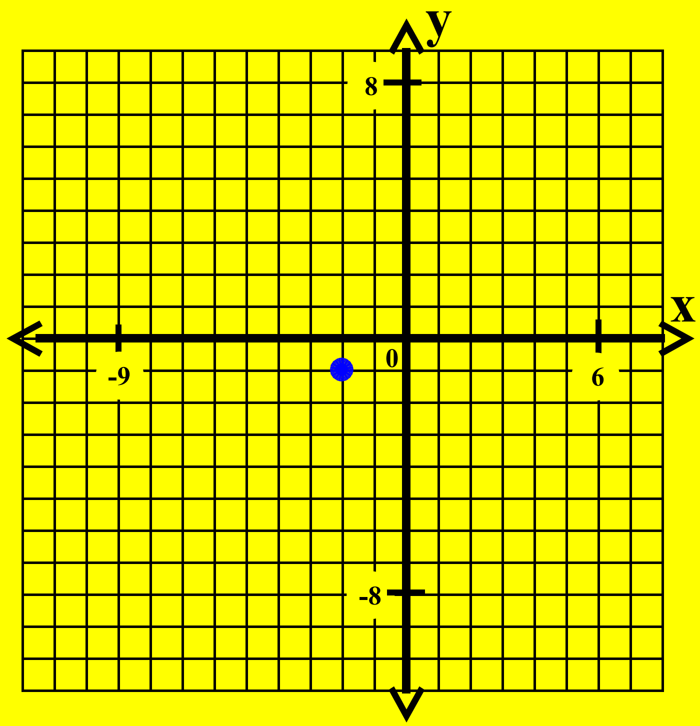

This a type 2 Hyperbola.

$h = -2$ and $k = -1$ ⇒ Center: $(-2, -1)$

$a^2 = 9$ and $b^2 = 16$ ⇒ $a =$

Standard Form Equation

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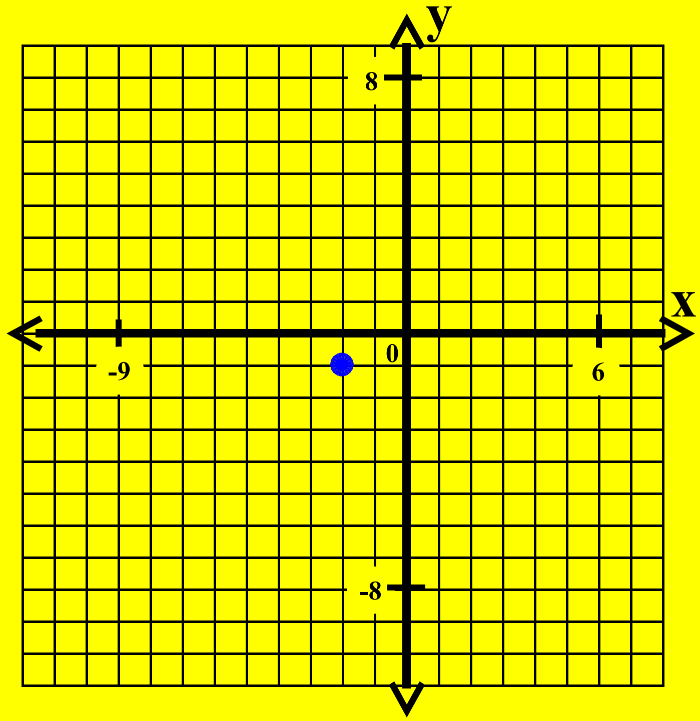
Standard Form Equation

$$\frac{(y+1)^2}{9} - \frac{(x+2)^2}{16} = 1$$



This a type 2 Hyperbola.

$h = -2$ and $k = -1$ ⇒ Center: $(-2, -1)$

$a^2 = 9$ and $b^2 = 16$ ⇒ $a = 3$

Standard Form Equation

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

Class Worksheet #3

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Standard Form Equation

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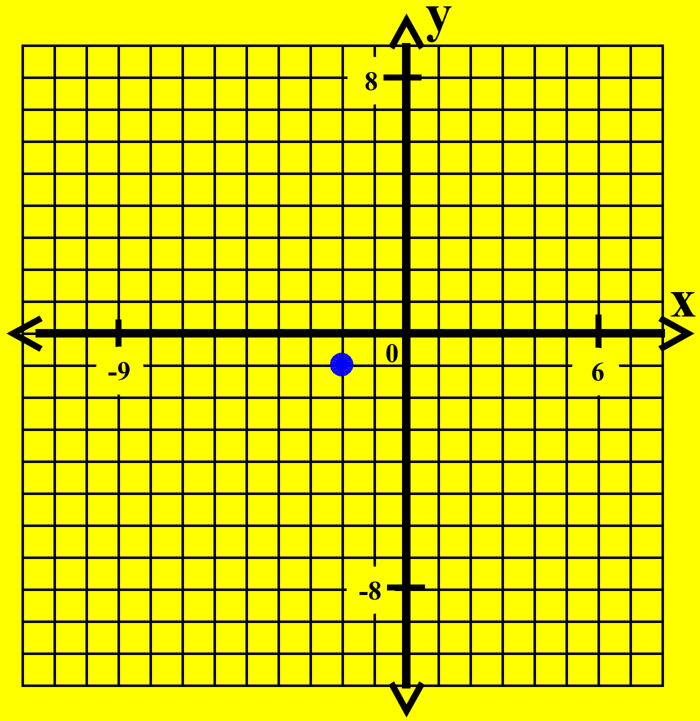

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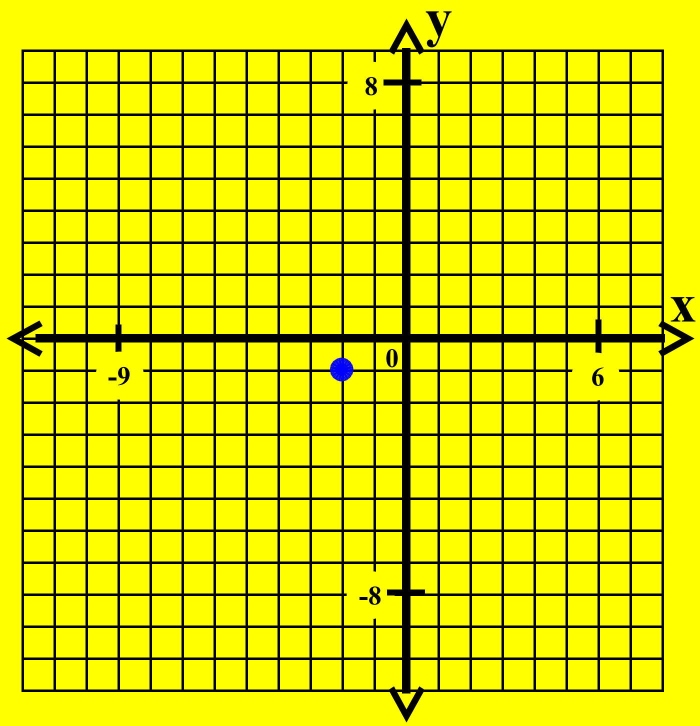

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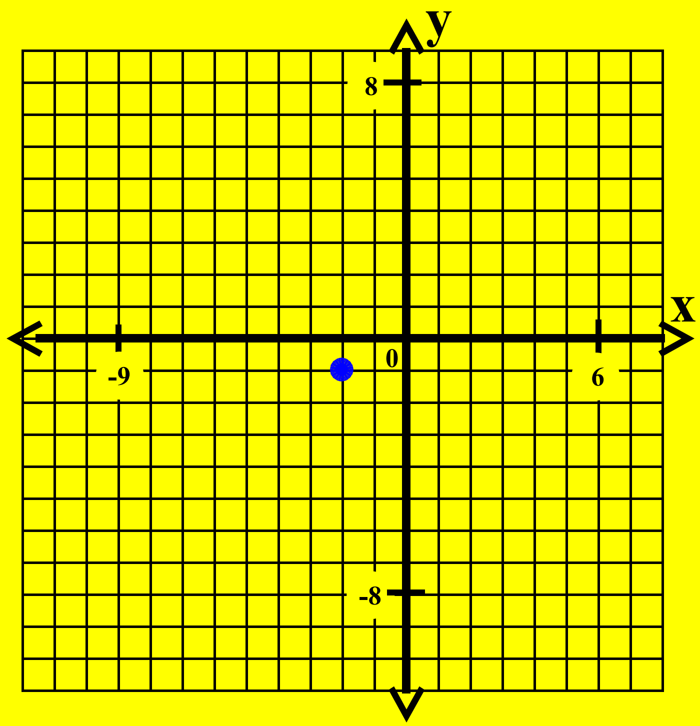

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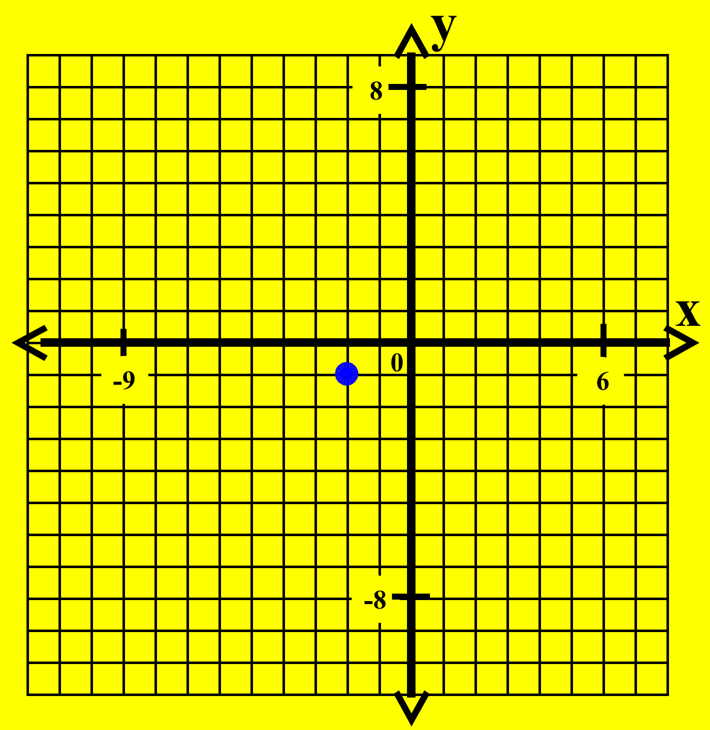

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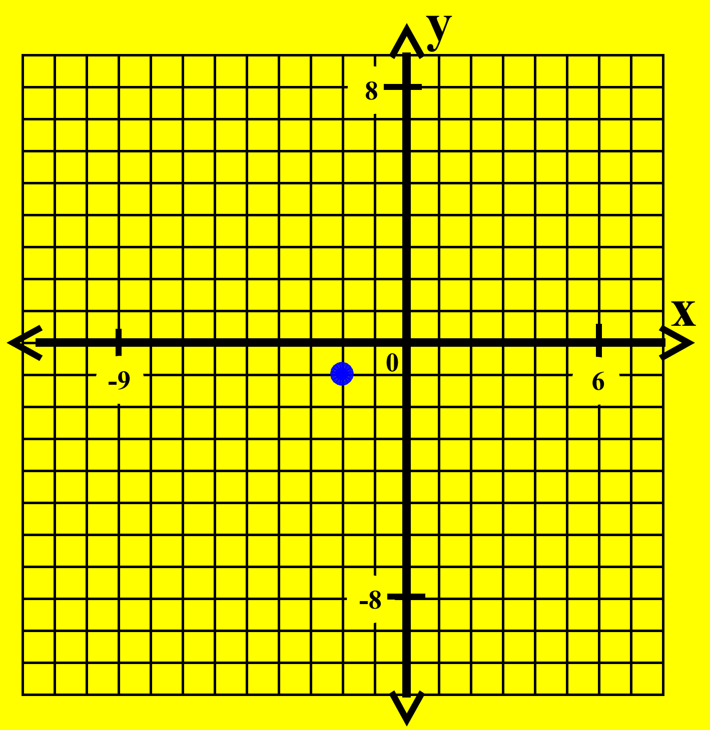

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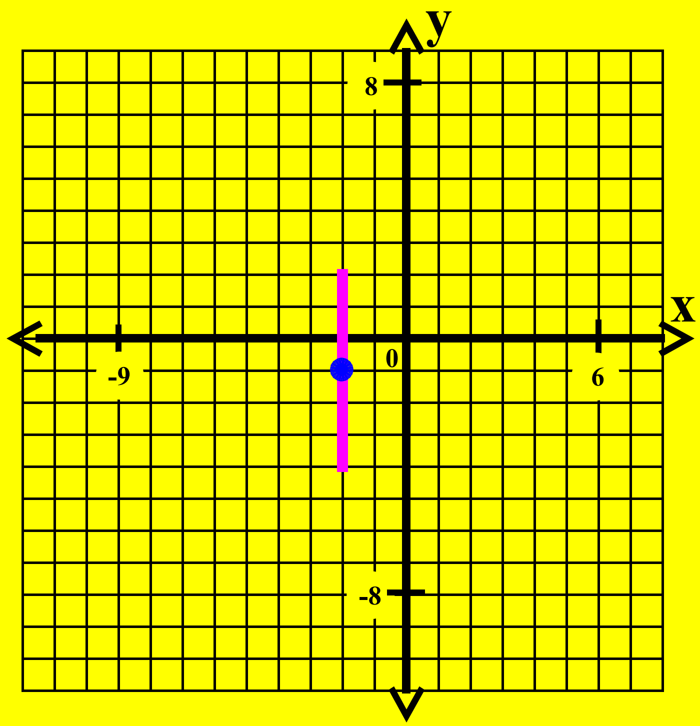

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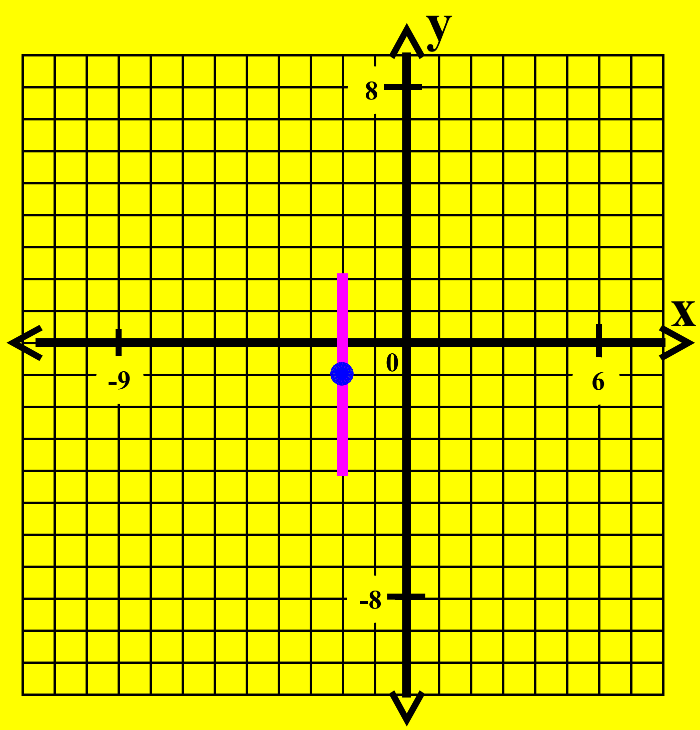

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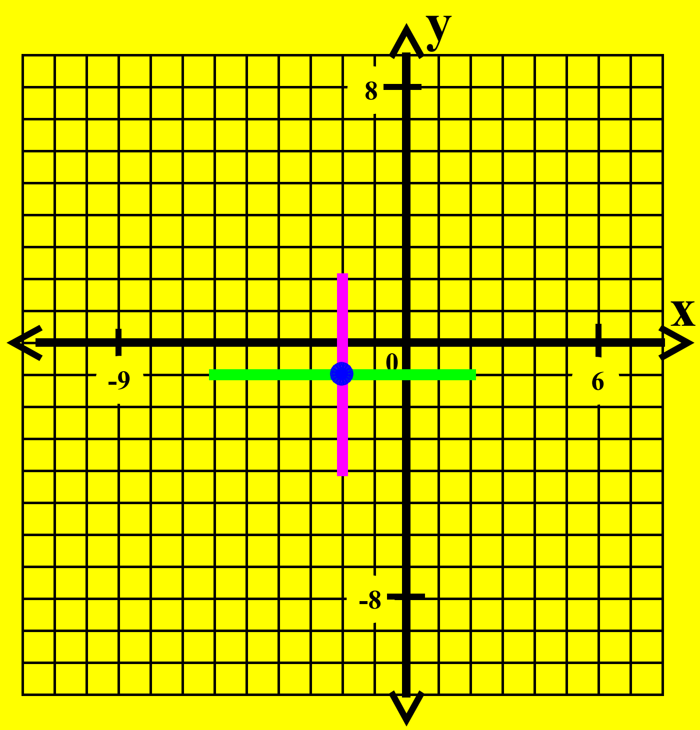

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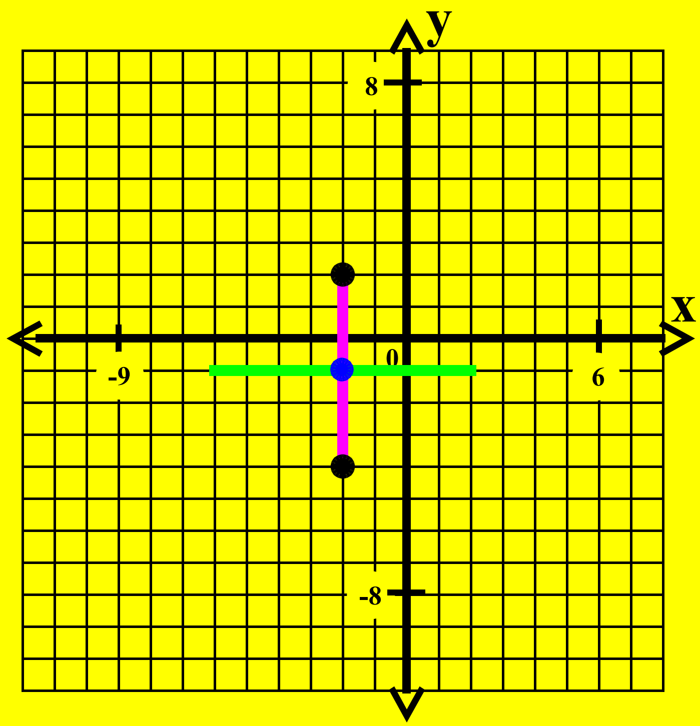

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Each endpoint of the transverse axis

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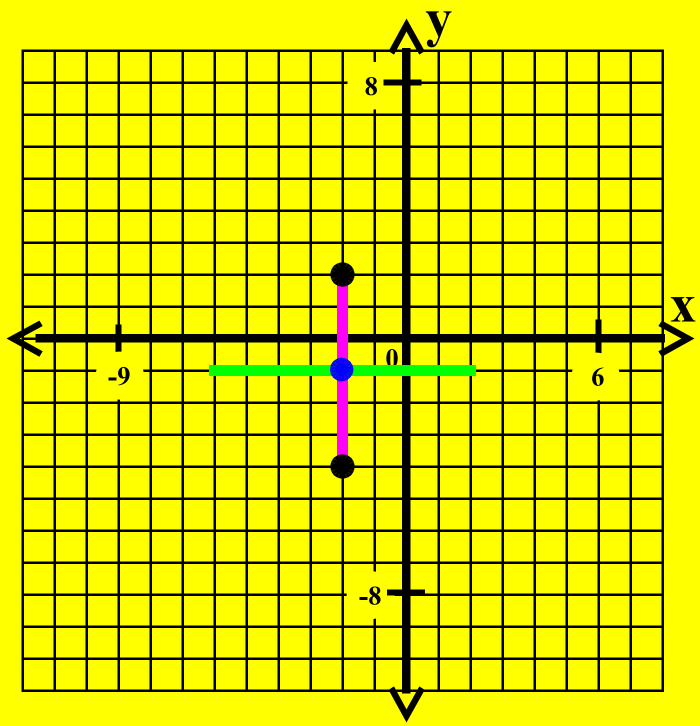

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Each endpoint of the transverse axis is a vertex of the hyperbola.

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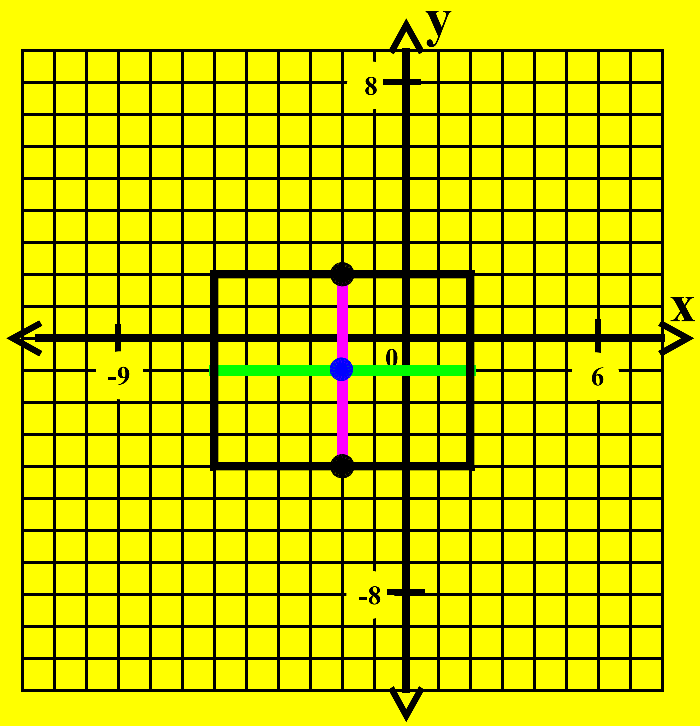

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The diagonals of this rectangle

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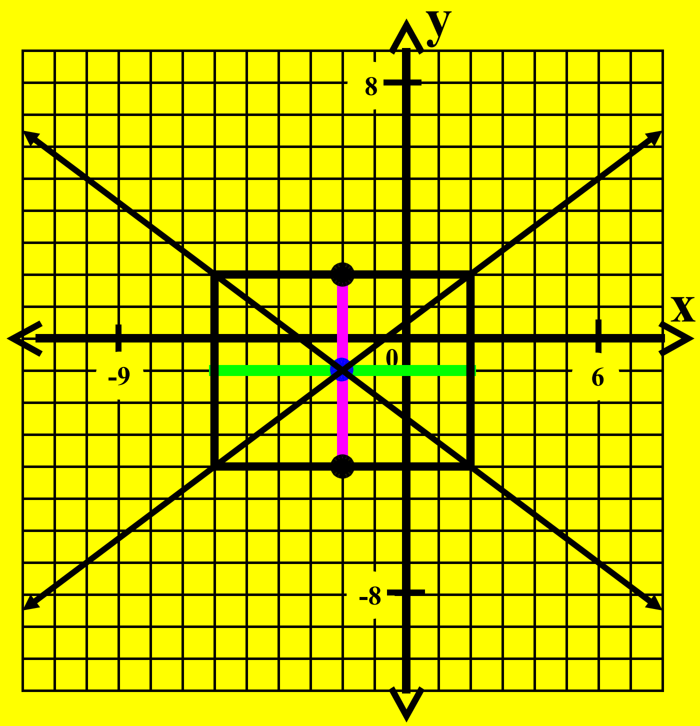

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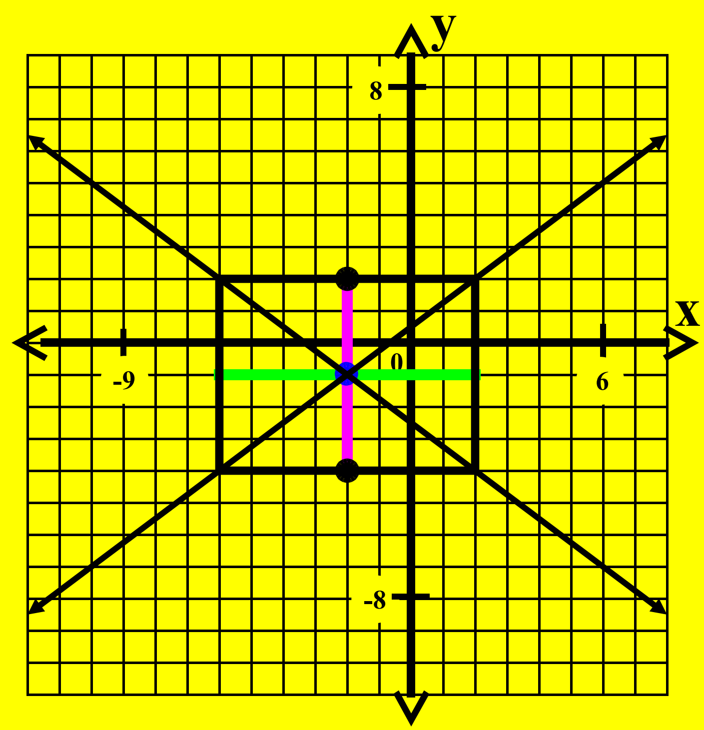

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The diagonals of this rectangle determine the asymptotes of the hyperbola.

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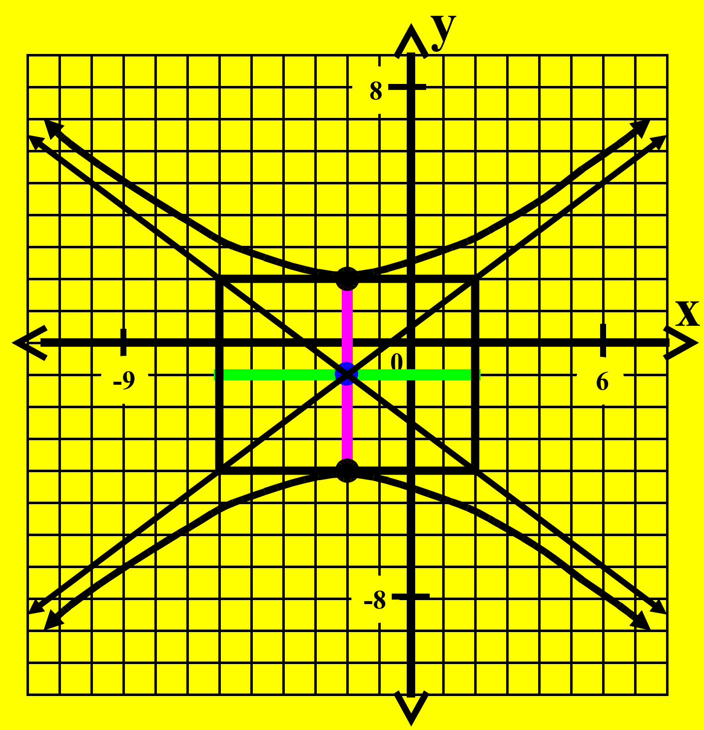

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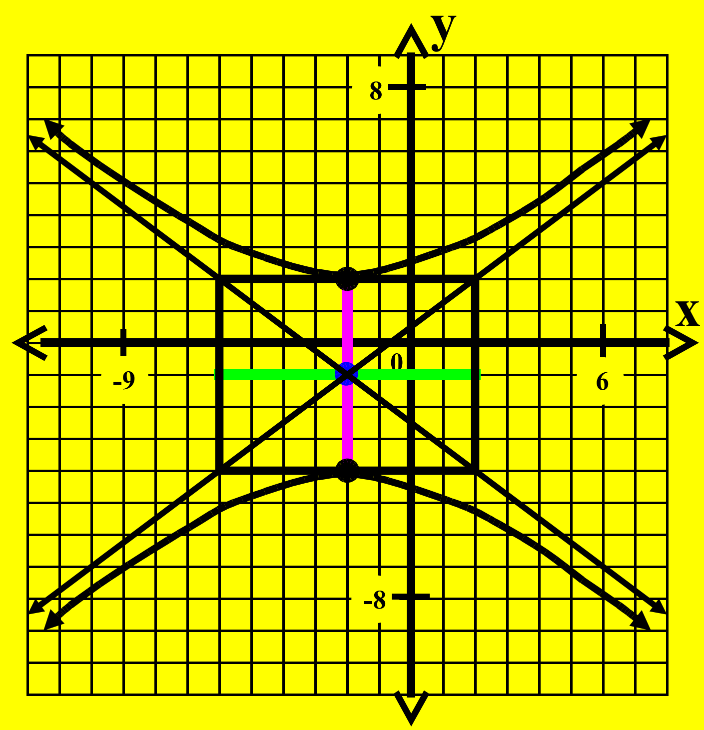

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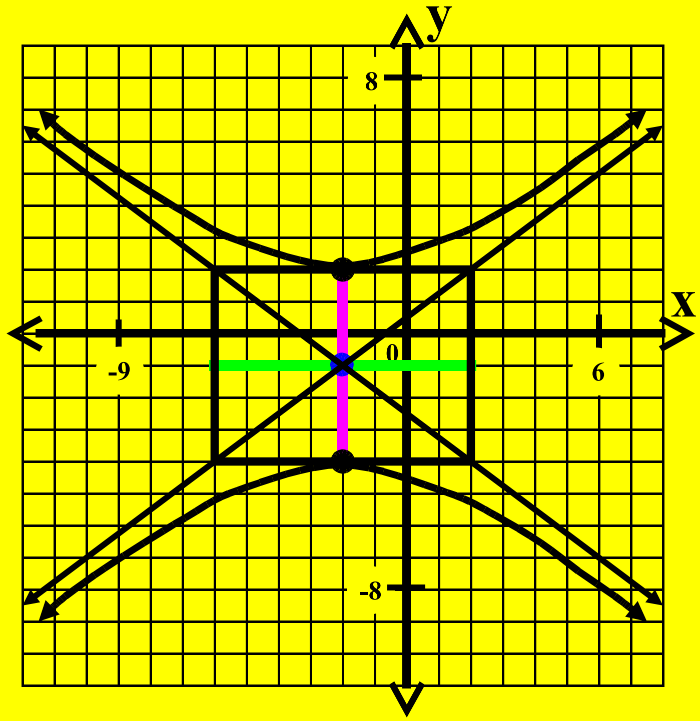
Each focus is c units from the center



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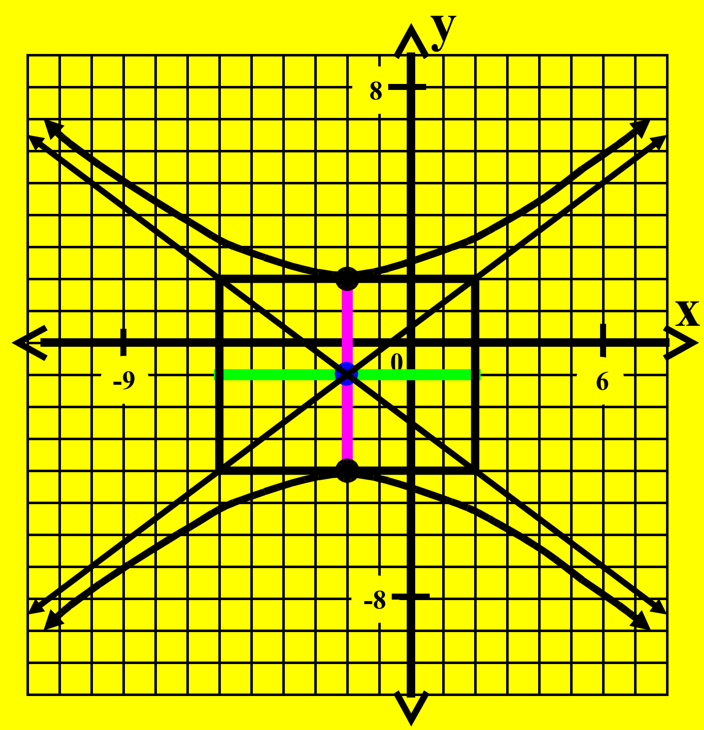
Each focus is c units from the center where $c^2 = a^2 + b^2$.



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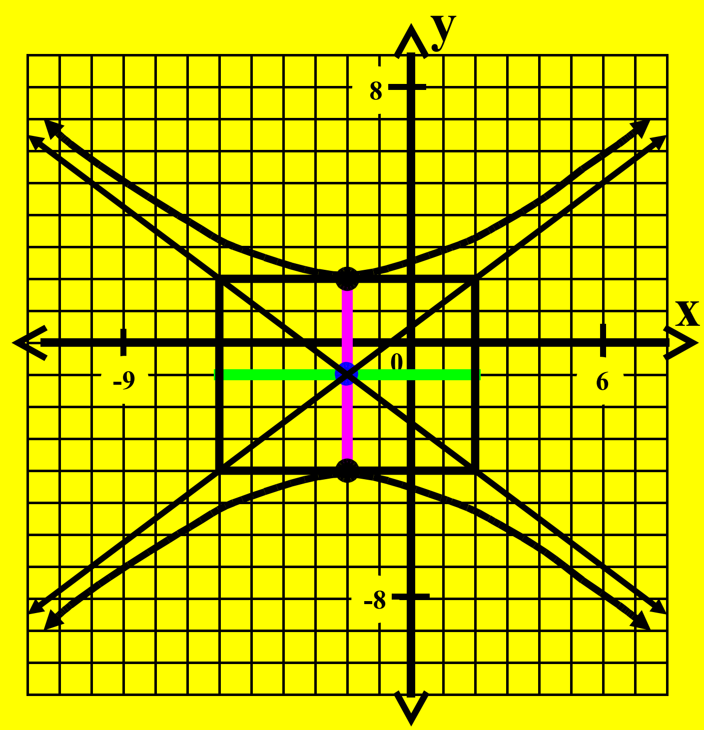

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$c^2 =$

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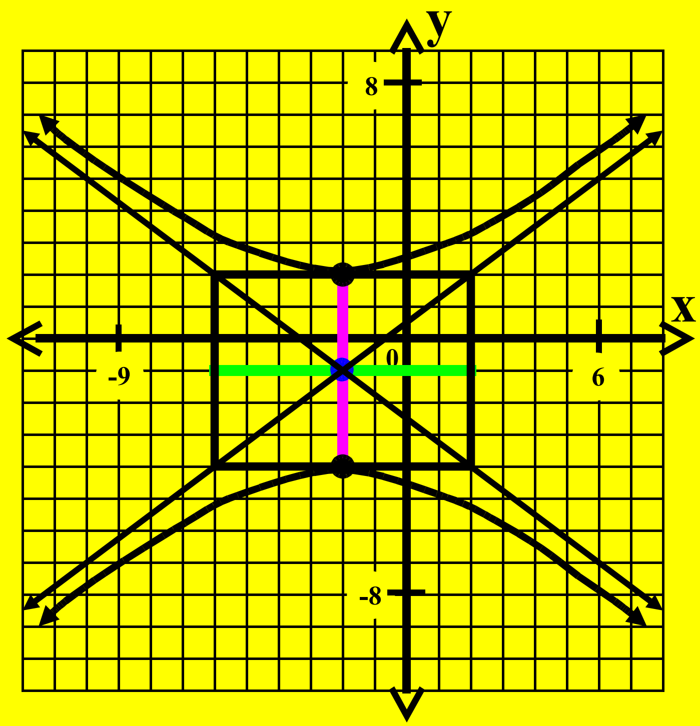

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$c^2 = 9$

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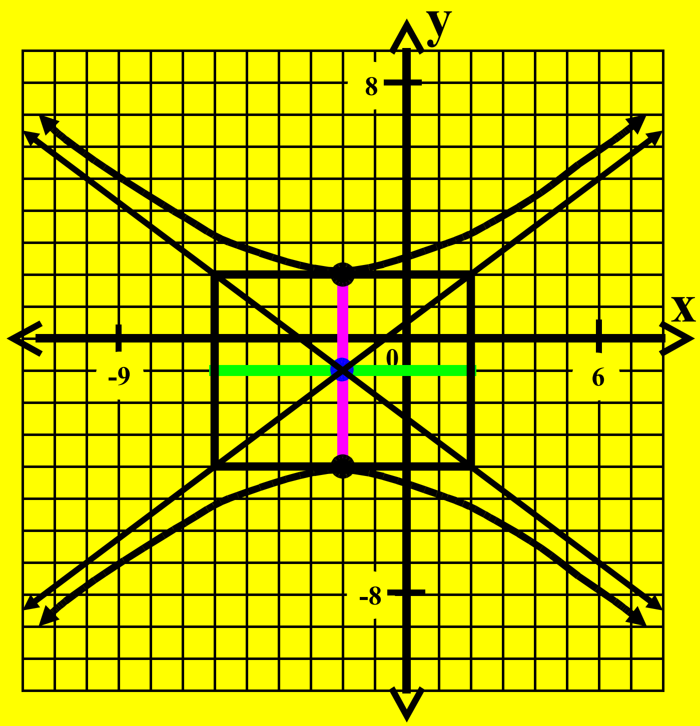

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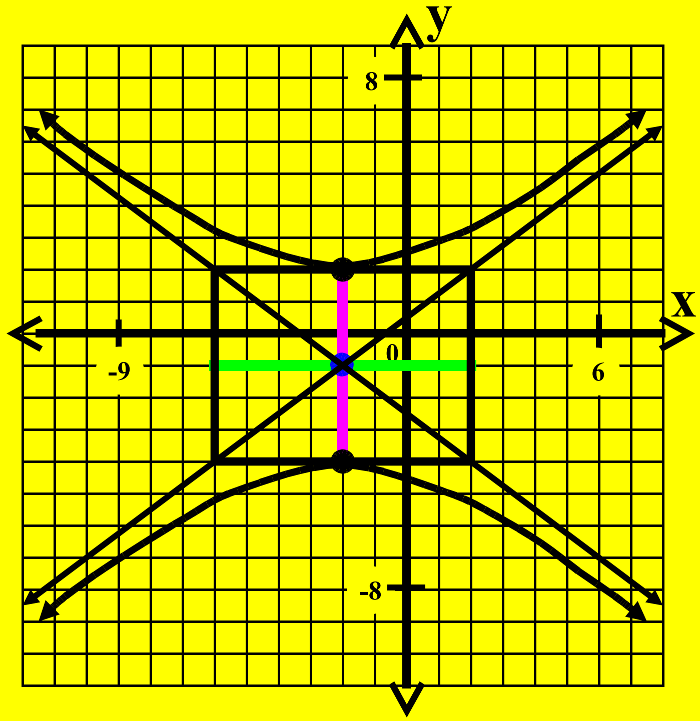

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$c^2 = 9 + 16$

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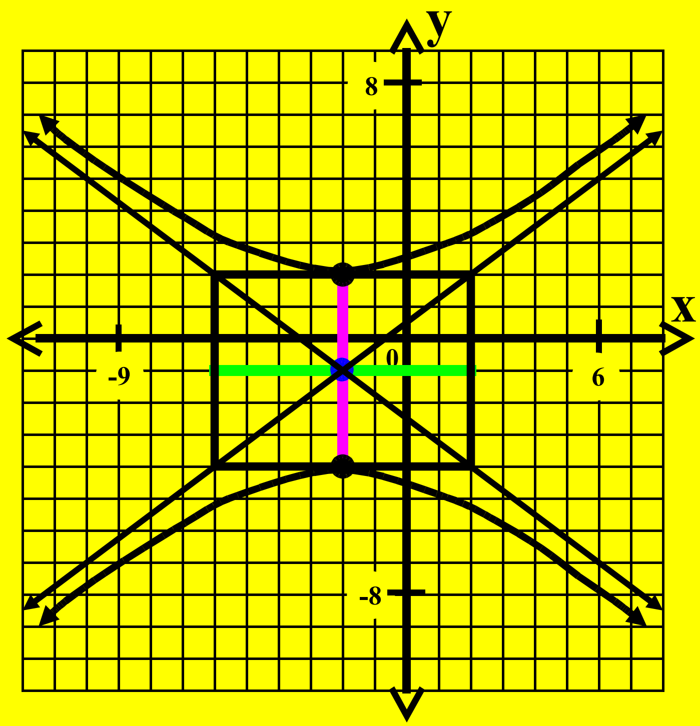

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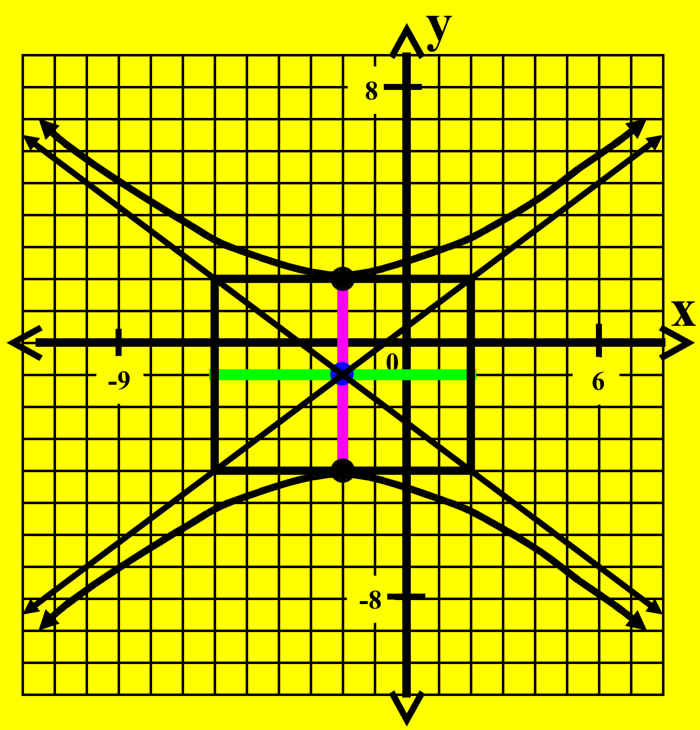

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Each focus is c units from the center where $c^2 = a^2 + b^2$.

$c^2 = 9 + 16 = 25$

Class Worksheet #3

Express each equation using 'standard form' and sketch a graph.

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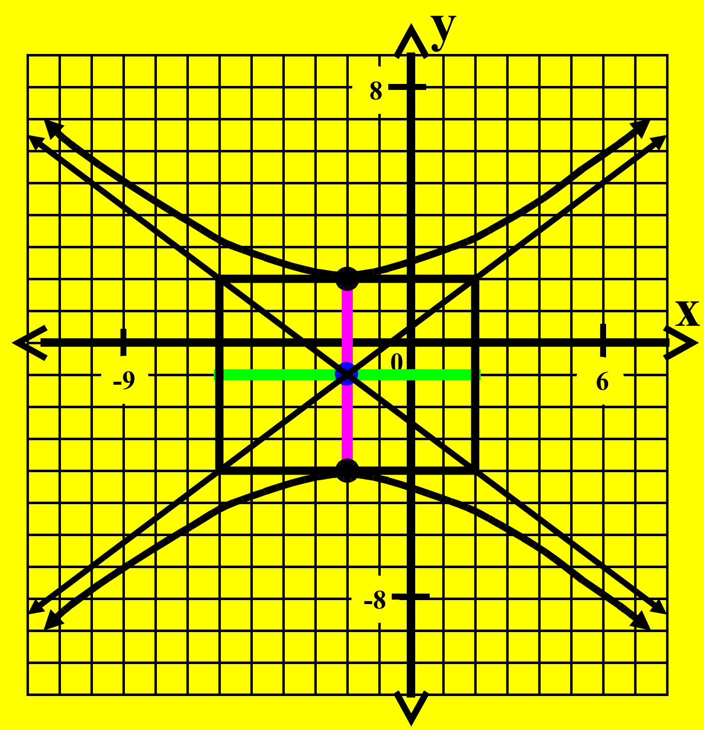
$c^2 = 9 + 16 = 25$

$c =$



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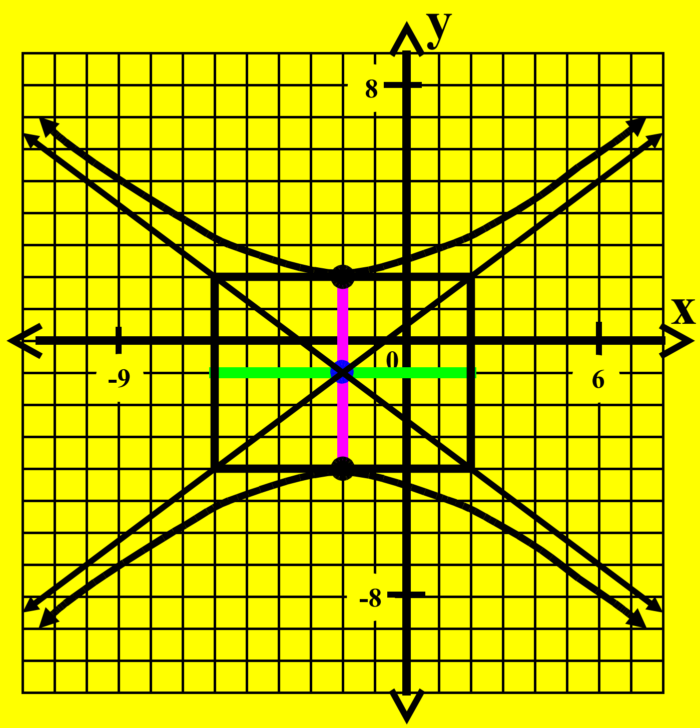

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$a^2 = 9$ and $b^2 = 16$ ⇨ $a = 3$ and $b = 4$

Each focus is c units from the center where $c^2 = a^2 + b^2$.

$c^2 = 9 + 16 = 25$

$c = 5$

Class Worksheet #3

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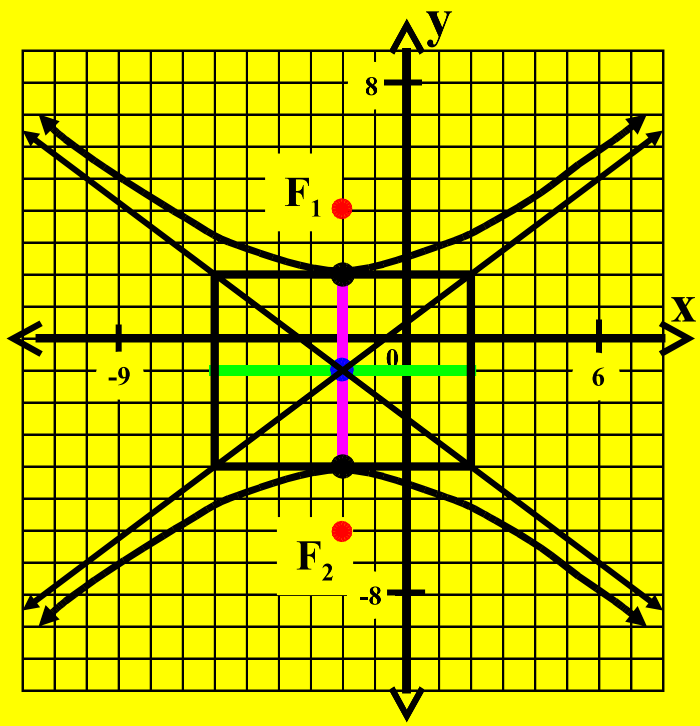

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$c^2 = 9 + 16 = 25$

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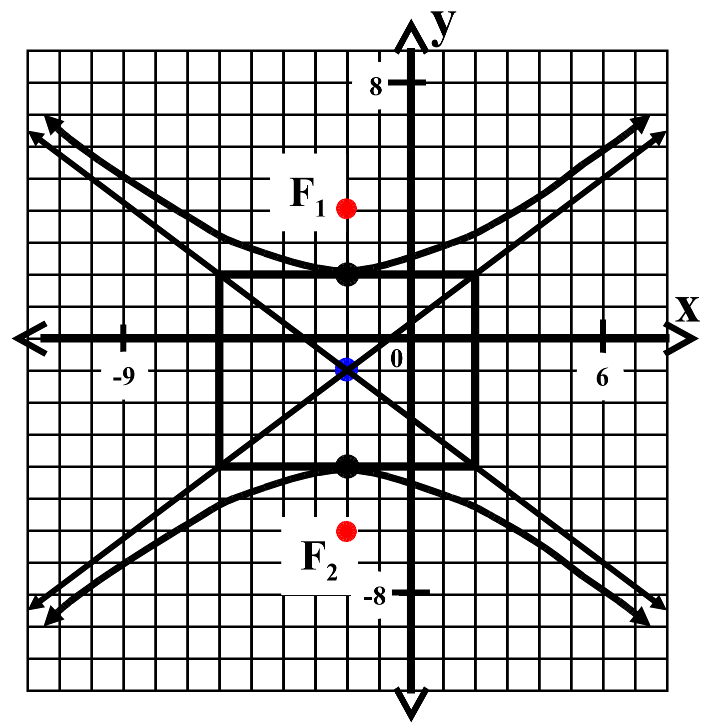

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