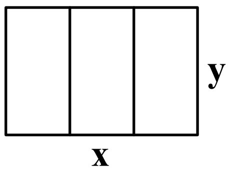
General Algebra 2 Worksheet #8 Unit 9 Selected Solutions

2. Sue wants to fence in a rectangular plot of land and to divide it into three equal areas using two lengths of fencing parallel to two opposite sides. If he has a total of 2000 feet of fencing to work with, then find the dimensions that will maximize the total area enclosed. What is the maximum area?



Consider the diagram shown. Let x represent the length of the rectangular plot of land. Let y represent its width. Clearly, the total amount of fencing required is $2x + 4y$.

Once again, to maximize the area, we must represent the area as a function of one variable.

$A = xy$ **where** $2x + 4y = 2000$

$4y = -2x + 2000$

$y = -0.5x + 500$

Therefore, $A = f(x) = x(-0.5x + 500)$

$A = f(x) = -0.5x^2 + 500x$

The maximum area corresponds to the vertex of this function. There are two common methods used to find the vertex.

At the vertex, $x = -B/2A$.

$x = -500/(-1) = 500$

The maximum area is

$f(500) = -0.5(500)^2 + 500(500) = 125{,}000$

$A = -0.5(x^2 - 1000x)$

$A - 125{,}000 = -0.5(x^2 - 1000x + 250{,}000)$

$A - 125{,}000 = -0.5(x - 500)^2$

The vertex is (500, <u>125,000</u>).

For maximum area, $x = 500$.

$y = -0.5(500) + 500 = -250 + 500 = 250$.

The plot with maximum area is 500 feet long and 250 feet wide.
The plot will have a maximum area of 125,000 square feet.