## Algebra II Worksheet \#7 Unit 7 Selected Solutions page 1

Identify each equation as that of a circle, ellipse, hyperbola, or parabola.
Express the equation in standard form and sketch its graph.

1. $x^{2}-4 y^{2}-2 x-24 y-39=0$

## hyperbola

$$
\begin{gathered}
1\left(x^{2}-2 x+1\right)-4\left(y^{2}+6 y+9\right)=39+1-36 \\
1(x-1)^{2}-4(y+3)^{2}=4
\end{gathered}
$$

## Standard form

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

Type 1

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

$$
\begin{array}{lll}
h=1 & k=-3 & \text { center }(1,-3) \\
\mathbf{a}=2 & b=1 & \mathbf{c}^{2}=5 \\
& & \mathbf{c}=\sqrt{5} \approx 2.2
\end{array}
$$


2. $x^{2}+9 y^{2}+2 x-18 y+1=0$

## ellipse

$$
\begin{gathered}
1\left(x^{2}+2 x+1\right)+9\left(y^{2}-2 y+1\right)=-1+1+9 \\
1(x+1)^{2}+9(y-1)^{2}=9
\end{gathered}
$$

## Standard form

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

Type 1

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

$$
h=-1 \quad k=1 \quad \text { center }(-1,1)
$$

$$
\mathbf{a}=\mathbf{3}
$$

$$
b=1 \quad c^{2}=8
$$

$$
\mathbf{c}=\sqrt{\mathbf{8}} \approx 2.8
$$



Algebra II Worksheet \#7 Unit 7 Selected Solutions page 2
Identify each equation as that of a circle, ellipse, hyperbola, or parabola.
Express the equation in standard form and sketch its graph.
3. $x^{2}+y^{2}-6 x+8 y=0$ circle
$\left(x^{2}-6 x+9\right)+\left(y^{2}+8 y+16\right)=0+9+16$
standard form
$(x-3)^{2}+(y+4)^{2}=25$
center: $(3,-4) \quad r=5$

4. $x^{2}+2 x+4 y-11=0$
parabola

$$
\begin{gathered}
x^{2}+2 x+1=-4 y+11+1 \\
(x+1)^{2}=-4 y+12 \\
(x+1)^{2}=-4(y-3) \\
\text { standard form } \\
y-3=\frac{-1}{4}(x+1)^{2}
\end{gathered}
$$

Type 2

$$
y-k=a(x-h)^{2} \quad a=\frac{1}{4 p}=\frac{-1}{4}
$$

$$
h=-1 \quad k=3 \quad p=-1
$$

$$
V(-1,3) \quad \text { opens 'down' }
$$



