Honors Algebra II

Notes Section 8.6

Translate and Classify Conic Sections

Standard Form of Equations of Translated Conics

In the following equations, the point (h, k) is the *vertex* of the parabola and the *center* of the other conics.

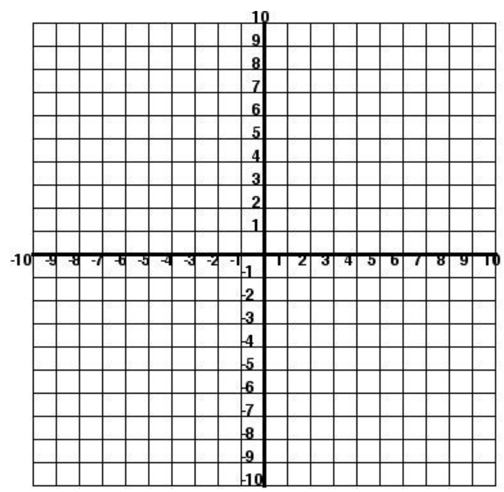
Circle $(x-h)^2 + (y-k)^2 = r^2$

	Horizontal axis	Vertical axis
Parabola	$(y-k)^2 = 4p(x-h)$	$(x-h)^2 = 4p(y-k)$
Ellipse	$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$	$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$
Hyperbola	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$

EXAMPLE 1 **Graph.** $(x-2)^2 + (y+3)^2 = 9.$

STEP 1 Identify the radius.

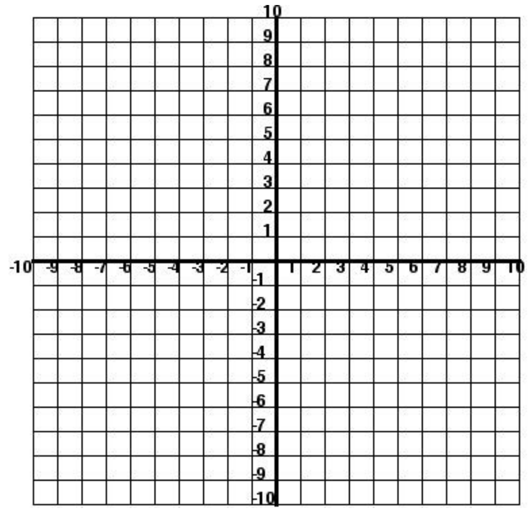
STEP 2 Graph the, plot the points to form the radii and complete the circle.



EXAMPLE 2a $(x+3)^2 - \frac{(y-4)^2}{4} = 1$ **STEP 1** Vertical or Horizontal.

STEP 2 Identify a, b and c.

STEP 3 Find the Center, Vertices, Co-Vertices, Foci, and Asymptotes.

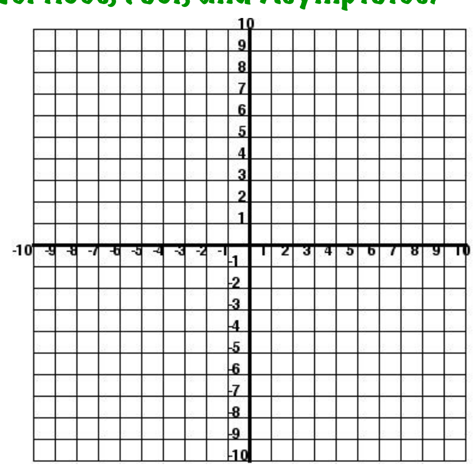


STEP 4 Graph

b) Graph $\frac{(y-3)^2}{4} - \frac{(x+1)^2}{9} = 1.$ **STEP 1** Vertical or Horizontal.

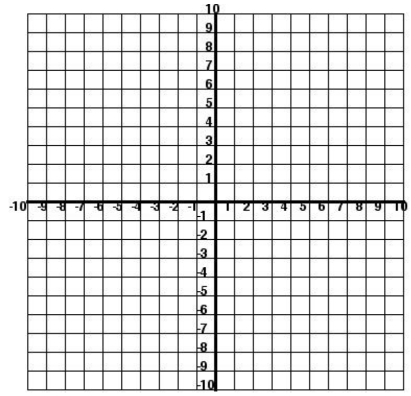
STEP 2 Identify a, b and c.

STEP 3 Find the Center, Vertices, Co-Vertices, Foci, and Asymptotes.



STEP 4 Graph

EXAMPLE 3 Write an equation of the parabola whose vertex is at (-2,3) and whose focus is at (-4,3).



STEP 1 Sketch to determine the form of the parabola.

STEP 2 Identify h and k.

STEP 3 Find p.

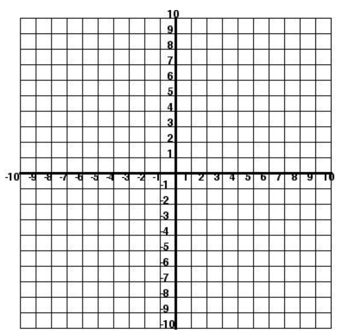
STEP 4 Write equation.

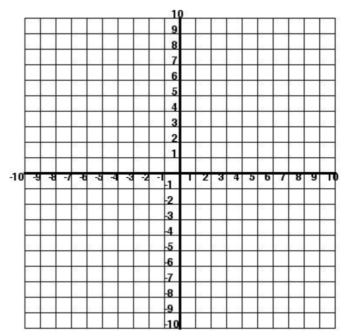
EXAMPLE 3 Write an equation of the ellipse with the given foci and co-vertices.

a) Foci: (1,2) and (7,2)
Co-V: (4,0) and (4,4)

b) Foci: (3,5) and (3, -1)
Co-V: (1,2) and (5,2)

STEP 1 Sketch to determine the form of the ellipse.





STEP 2 Find the center and identify h and k.

STEP 3 Find b and c.

STEP 4 Find a.

STEP 5 Write the equation.

EXAMPLE 5 Identify the line(s) of symmetry for each conic section in EXAMPLES 1-4.

a) EXAMPLE 1 ______________________________

b) EXAMPLE 2a ______________________________

EXAMPLE 2b ______________________________

c) EXAMPLE 3 ______________________________

d) EXAMPLE 4a ______________________________

EXAMPLE 4b ______________________________

Classifying Conics Using Their Equations

Any conic can be described by a **general second-degree equation** in x and y: $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. The expression $B^2 - 4AC$ is the **discriminant** of the equation and can be used to identify the type of conic.

Discriminant	Type of Conic
$B^2 - 4AC < 0$, $B = 0$, and $A = C$	Circle
$B^2 - 4AC < 0$ and either $B \neq 0$ or $A \neq C$	Ellipse
$B^2 - 4AC = 0$	Parabola
$B^2 - 4AC > 0$	Hyperbola

If $B = 0$, each axis of the conic is horizontal or vertical.

EXAMPLE 6 Classify the conic section given. Then graph their equation.

a) $4x^2 + y^2 - 8x - 8 = 0$

a = _____ b = _____ c = _____

Center:______

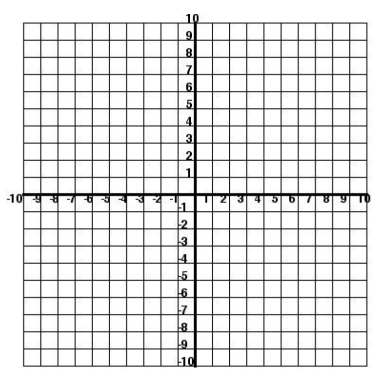
a = ______

b = ______ c = ______

Vertices: ___________________

Co-Vertices: _________________

Foci: ______________________



b) $x - 3 = 1/2(y-2)^2$

a = _____ b = _____ c = _____

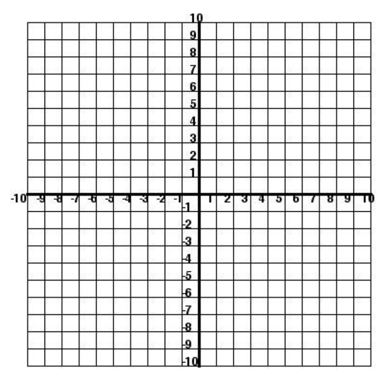
Vertex: ______

4p = ______

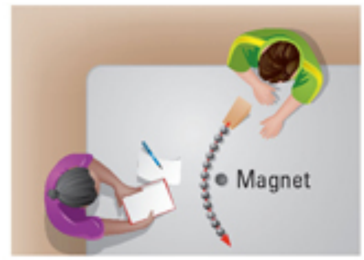
p = ______

Focus: ______

Directrix: ______



EXAMPLE 7 In a lab experiment, you record images of a steel ball rolling past a magnet. The equation $16x^2 - 9y^2 - 96x + 36y - 36 = 0$. Models the ball's path.



a) What is the shape of the path?

b) Write an equation for the path in standard form.

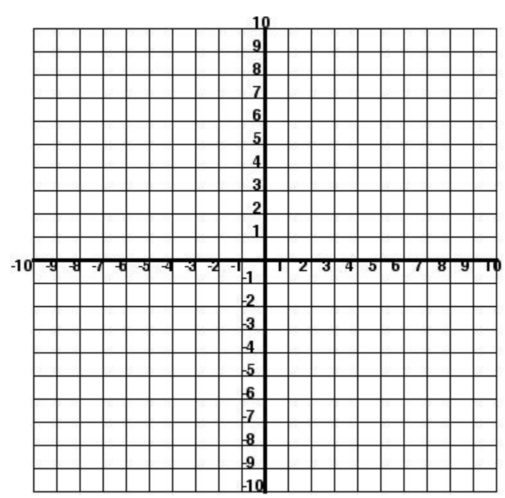
$$16x^2 - 9y^2 - 96x + 36y - 36 = 0$$

c) Graph the equation.

a = ______

b = ______

c = ______



Center:______

Vertices: ______________________

Co-Vertices: ______________________

Foci: ______________________