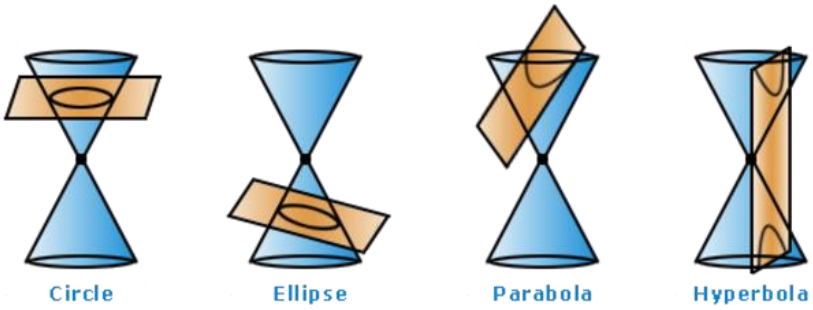
Precalculus with TRIG – Unit 9 – Conics

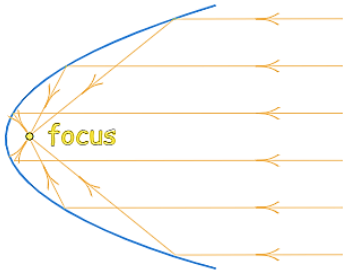
Day 1 – Section 9.3 – Graphing Parabolas with a Focus

Conic Sections:



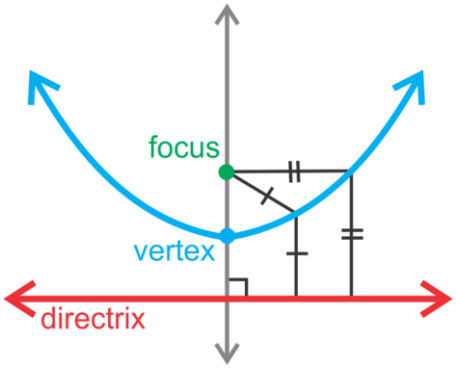
Graphing Parabolas using the Focus:

Focus:



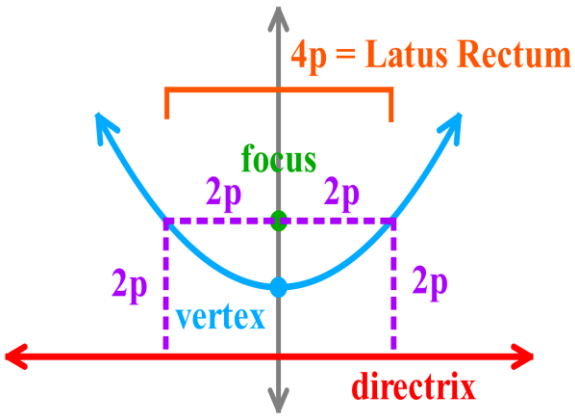
Vertex:

Axis of Symmetry:



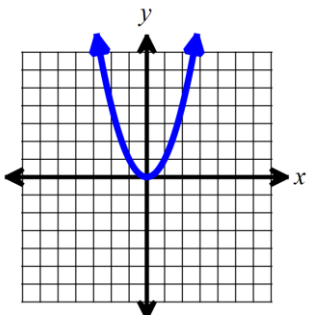
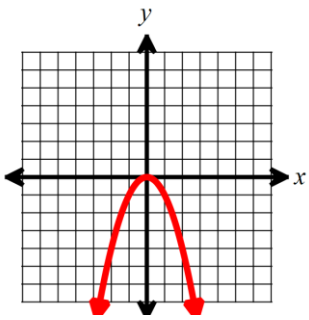
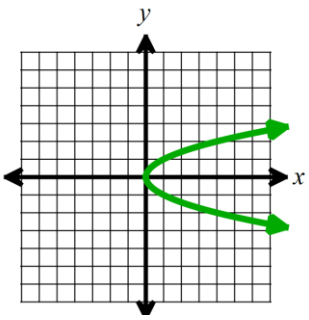
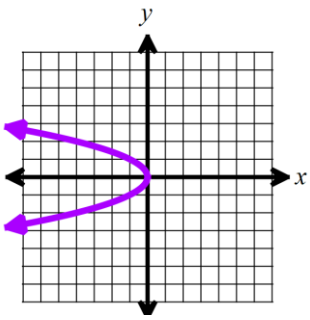
Directrix:

Latus Rectum (LR):



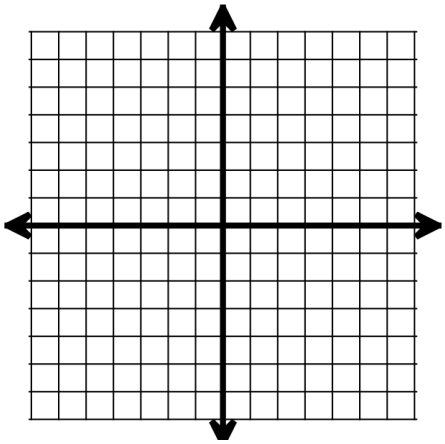
P:

Graphing Parabolas using the Focus:

x^2				y^2			
$(x-h)^2 = 4p(y-k)$				$(y-k)^2 = 4p(x-h)$			
Positive *p* value		**Negative *p* value**		**Positive *p* value**		**Negative *p* value**	
							
Focus:		**Focus:**		**Focus:**		**Focus:**	
Directrix:		**Directrix:**		**Directrix:**		**Directrix:**	
Vertex is always:							

Identify the direction the parabola opens, vertex, axis of symmetry, focus, and Directrix of each parabola. Then graph the parabola.

1) $y^2 = 8x$



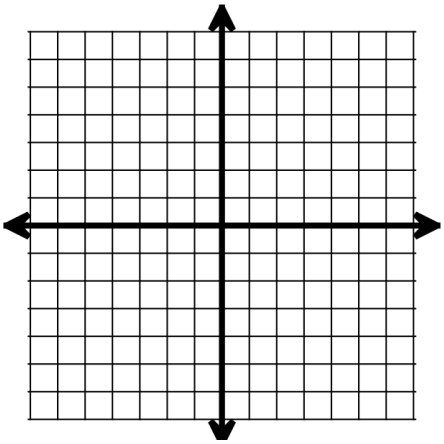
Vertex:_____ **Opening:**_____

P value: _____ **Focus:**_____

Directrix:_____ **Axis of Sym:**_____

Length of the LR:_____

a) $y^2 = -4x$



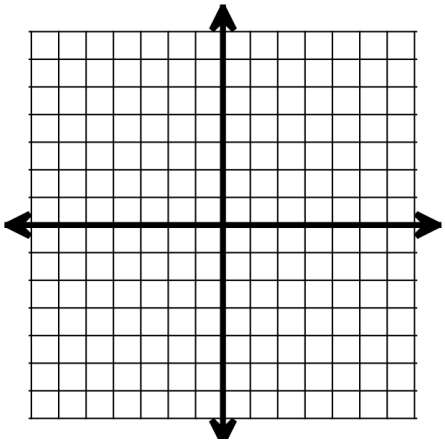
Vertex:_____ **Opening:**_____

Opening:_____ **Focus:**_____

Directrix:_____ **Axis of Sym:**_____

Length of the LR:_____

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



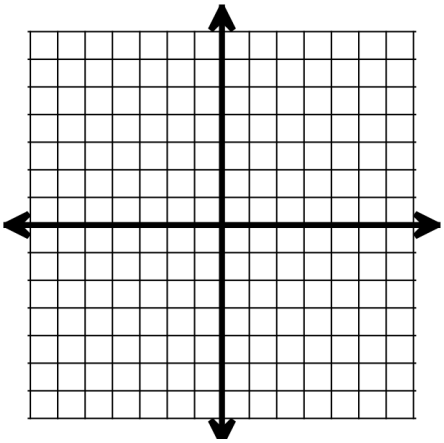
Vertex:_____ **Opening:**_____

P value: _____ **Focus:**_____

Directrix:_____ **Axis of Sym:**_____

Length of the LR:_____

3) $2x^2 = 6y - 24$



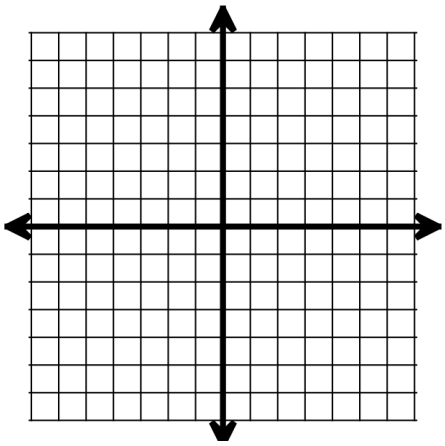
Vertex:_____ **Opening:**_____

Opening:_____ **Focus:**_____

Directrix:_____ **Axis of Sym:**_____

Length of the LR:_____

b) $(x-1)^2 = -8(y+1)$



Vertex:_____ **Opening:**_____

P value: _____ **Focus:**_____

Directrix:_____ **Axis of Sym:**_____

Length of the LR:_____

Day 2 – Section 9.3A – Writing the Equations of Parabolas

Objectives: SWBAT Write the equations of parabolas

Review:

Complete the Square: $y = x^2 - 6x + 17$

Write the standard equations for the following parabolas. Then state the vertex and direction it opens.

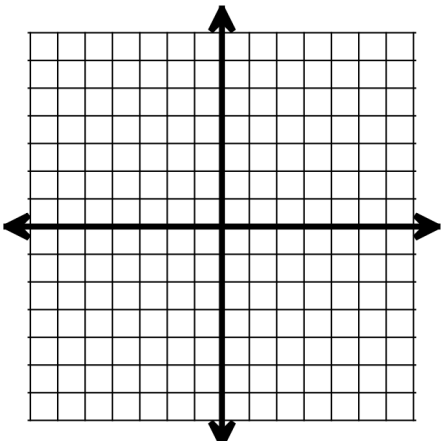
1) $x^2 - 8x - y - 21 = 0$

2) $y^2 - x + 6y + 16 = 0$

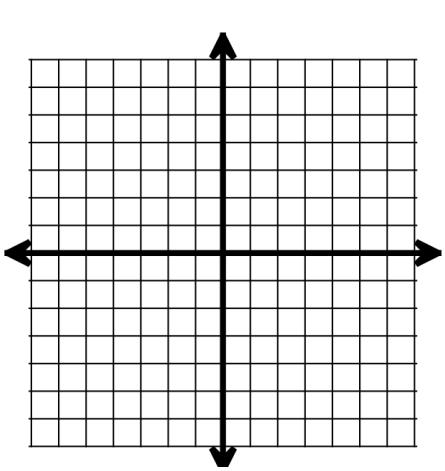
a) $x^2 + 25 = 12x + y - 13$

Write the standard equations for the following parabolas, and then graph the parabola.

3) $x^2 + 10x + 20y + 25 = 0$



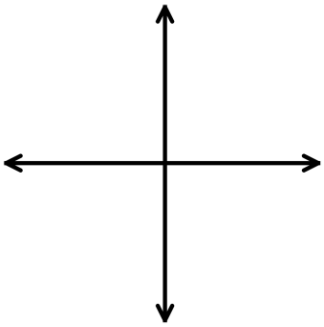
b) $y^2 - 12y + 16x = 60$



<u>Find the equation of a parabola with the given information.</u>

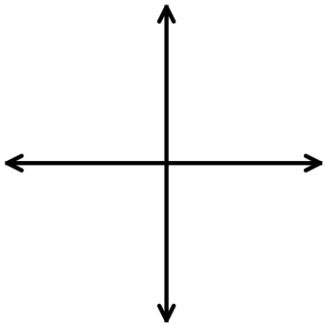
4) Vertex = $(0,0)$ and focus $(-5, 0)$

Mental Picture



c) Vertex = $(0,0)$ and focus = $(0, 8)$

Mental Picture



5) Vertex = $(3,2)$ and directrix $x = 5$

d) Vertex = $(0,0)$ and directrix $y = -5/12$

6) Vertex $=(-2, -1)$ and focus = $(-2,5)$

Day 3 – Section 9.1 – Graphing the Ellipse

Objectives: SWBAT Graph Ellipses and find important pieces of an ellipse

Ellipse:

Standard Equation:

Center:

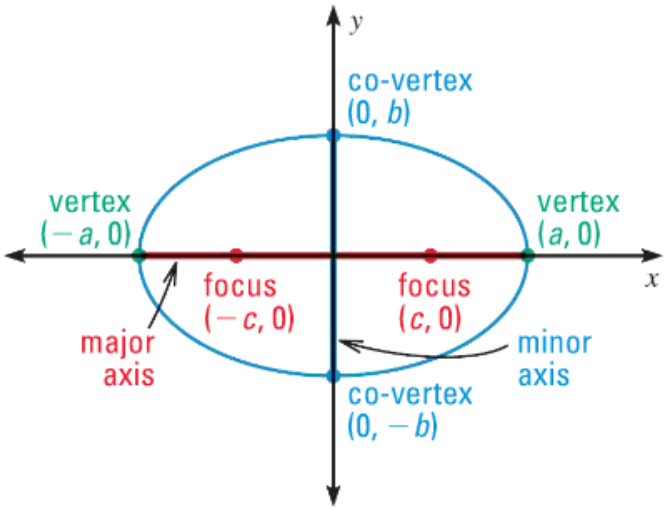
Foci (Focus):

Major Axis:

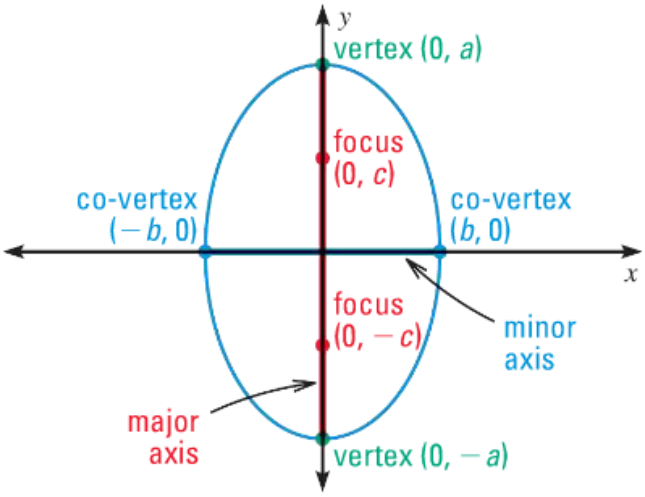
Vertices:

Co-vertices:

Minor axis:



Ellipse with horizontal major axis



Ellipse with vertical major axis

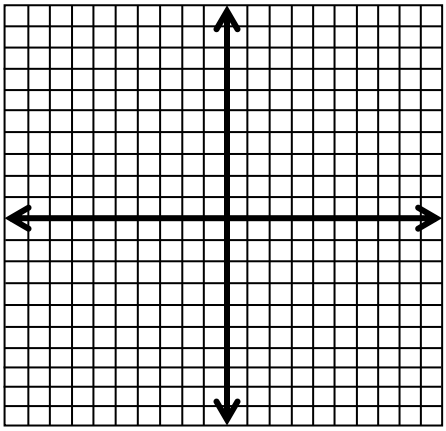
Equations for Ellipses:

Horizontal Ellipse	**General Formula**	$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ **where** $a>b$
	Not Centered at the Origin	$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$ **where** $a>b$
Vertical Ellipse	**General Formula**	$\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$ **where** $a>b$
	Not Centered at the Origin	$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$ **where** $a>b$

Length of Major Axis		**Vertices**	
Length of Minor Axis		**Co-Vertices**	
Focus or Foci	$c^2=a^2-b^2$	**Center**	

Graph the following ellipses.

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



Center:_____

Foci:_____

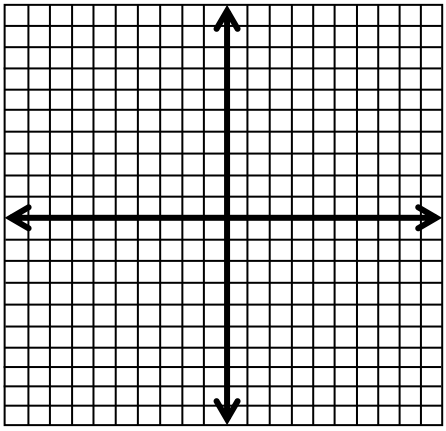
Vertices:_____

Co-Vertices:_____

Length of Major Axis:_____

Length of Minor Axis: _____

a) $\frac{x^2}{25}+\frac{y^2}{49}=1$



Center:_____

Foci:_____

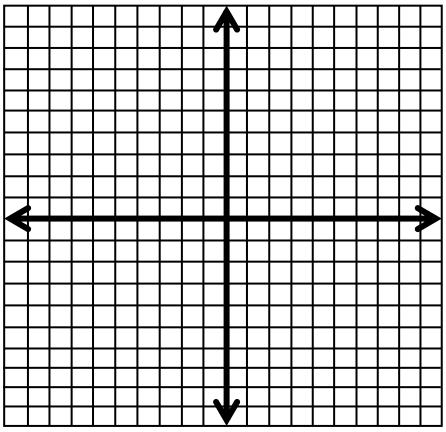
Vertices:_____

Co-Vertices:_____

Length of Major Axis:_____

Length of Minor Axis: _____

2) $\frac{(x-2)^2}{25} + \frac{(y-4)^2}{16} = 1$



Center:_____

Foci:_____

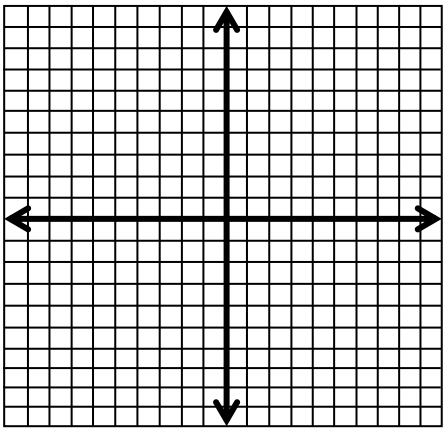
Vertices:_____

Co-Vertices:_____

Length of Major Axis:_____

Length of Minor Axis: _____

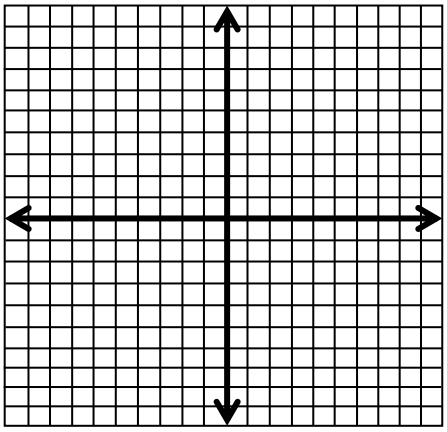
3) $16(x+2)^2 + 16(y-3)^2 = 16$



Center:_____

Foci:_____

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



Center:_____

Foci:_____

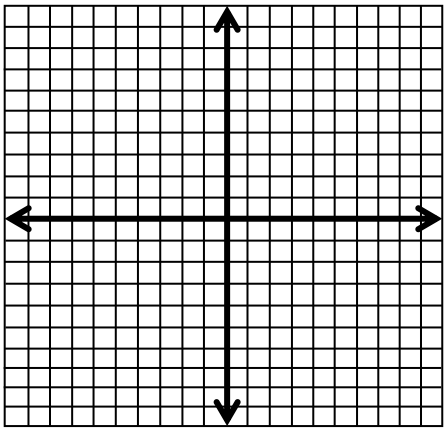
Vertices:_____

Co-Vertices:_____

Length of Major Axis:_____

Length of Minor Axis: _____

c) $6(x-1)^2 + \frac{y^2}{6} = 6$



Center:_____

Foci:_____

Vertices:_____

Co-Vertices:_____

Length of Major Axis:_____

Length of Minor Axis: _____

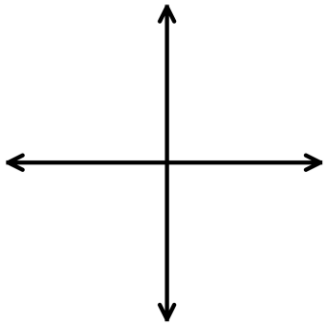
Day 4 – Section 9.1A – Writing Equations and Graphing Ellipses

Objectives: Write equations of ellipses given information and complete the square to get ellipses in standard form.

Find the standard form of the equation of each ellipse with the given conditions.

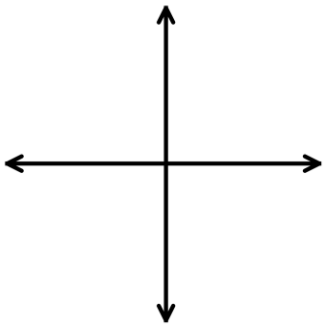
1) Foci: (-6,0), (6,0);
Vertices (-9,0), (9,0)

Mental Picture



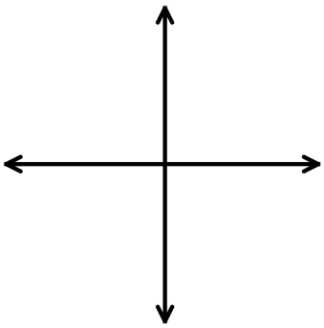
a) Foci: (0,-2), (0,2);
Vertices (0,-4) (0,4)

Mental Picture



3) Major axis is horizontal with length of 16; length of minor axis = 4; center (0,0)

Mental Picture



b) Major axis is vertical with length of 10; length of minor axis = 6; center $(2, -3)$

4) Endpoints of major axis: $(8,5)$ and $(8,17)$, and the endpoints of minor axis $(6,11)$ and $(10,11)$

5) Foci $(0,-4),(0,4)$ x-intercepts: -4 and 4

Double Completing the Square:

6) $x^2 + 2x + y^2 - 12y = 11$ (circle)

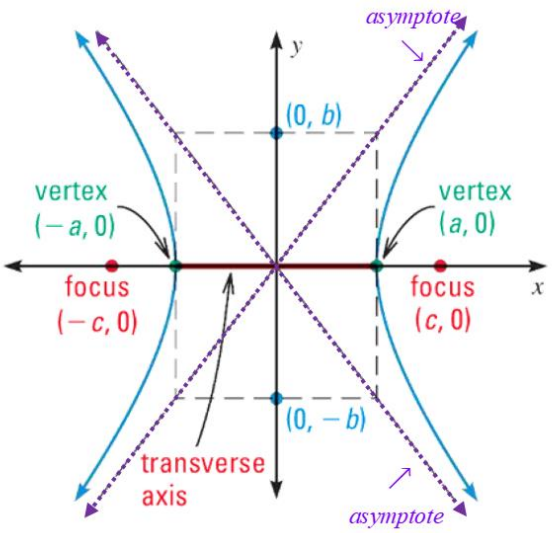
7) $9x^2 + 4y^2 - 18x + 16y - 11 = 0$

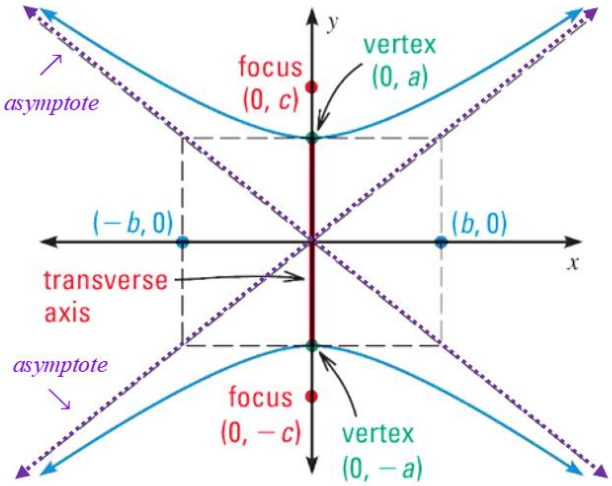
8) $4x^2 + 25y^2 - 24x + 50y - 66 = 0$

c) $16x + 4y^2 - 8y + 8x^2 = 4$

Day 5 – Section 9.2 – Graphing Hyperbolas

Objectives: **SWBAT graph and write equations for hyperbolas**





Hyperbola: **Transverse Axis:** **Conjugate Axis:**

Vertices: **Co Vertices:** **Order Matters:**

Horizontal Hyperbola	**General Formula**	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
	Not Centered at the Origin:	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$
	Asymptote Equation:	$y - k = \pm\frac{b}{a}(x - h)$
Vertical Hyperbola	**General Formula**	$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$
	Not Centered at the Origin	$\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$
	Asymptote Equation:	$y - k = \pm\frac{a}{b}(x - h)$

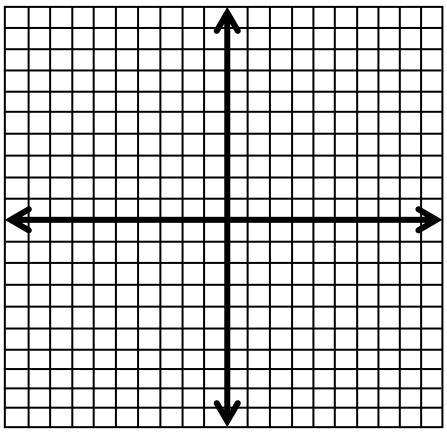
Length of Transverse (Major) Axis		**Vertices**	
Length of Conjugate (Minor) Axis		**Co-Vertices**	
Focus or Foci	$c^2 = a^2 + b^2$	**Center**	

Steps for Success with Hyperbolas

- **Determine the Direction (Vertical or Horizontal)**
- **Plot Vertices and Co-Vertices**
- **Draw the rectangle (Box) and the asymptotes with dotted lines**
- **Start graphing at the vertices and approach the asymptotes**

Graph the following hyperbolas, and find their attributes listed below.

1) $\frac{x^2}{16} - \frac{y^2}{25} = 1$



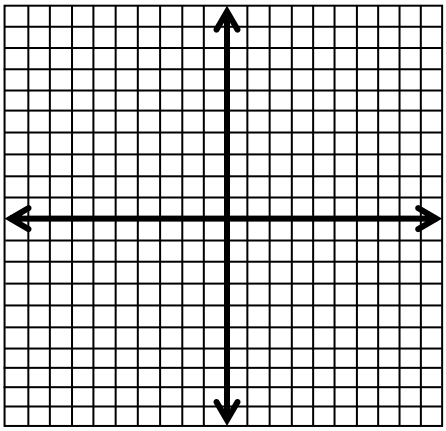
Center:_____**Transverse Axis:**_____

Vertices:_____

Foci:_____

Asymptote Equation: _____

2) $\frac{(y-2)^2}{9} - \frac{(x-4)^2}{16} = 1$



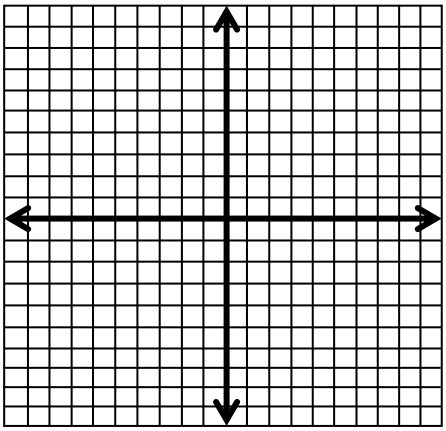
Center:_____**Transverse Axis:** _____

Vertices:_____

Foci:_____

Asymptote Equation: _____

a) $\frac{(y-1)^2}{25} - \frac{x^2}{9} = 1$



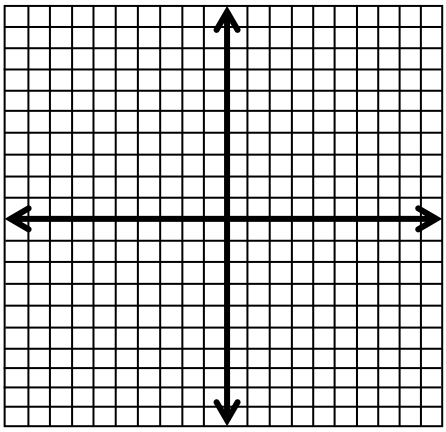
Center:_____**Transverse Axis:**_____

Vertices:_____

Foci:_____

Asymptote Equation: _____

3) $16x^2 - y^2 = 16$



Center:_____**Transverse Axis:** _____

Vertices:_____

Foci:_____

Asymptote Equation: _____

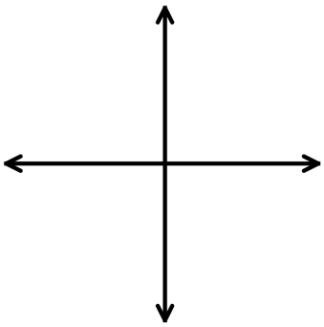
Day 6 – Section 9.2A – Graphing Hyperbolas

Objectives: **SWBAT write equations for hyperbolas**

Find the standard form of the equation of each hyperbola with the given conditions.

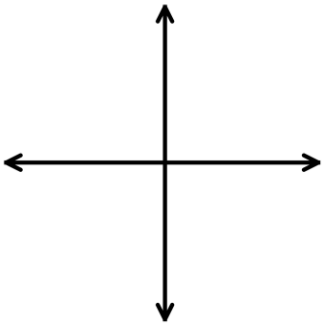
1) Foci: $(0,-2)$ & $(0,2)$; vertices: $(0,-1)$ & $(0,1)$

Mental Picture

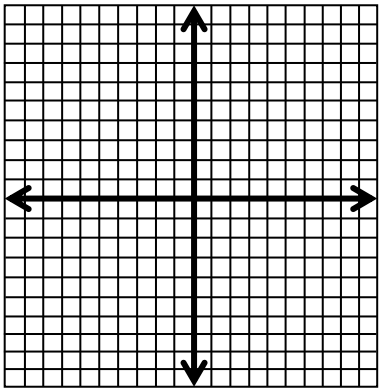


a) Foci: $(-8,0)$ & $(8,0)$; vertices: $(-5,0)$ & $(5,0)$

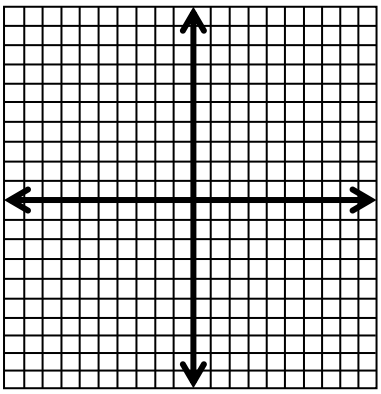
Mental Picture



2) Endpoints of the transverse axis: $(0,-8)$ & $(0,8)$; asymptote: $y = 2x$



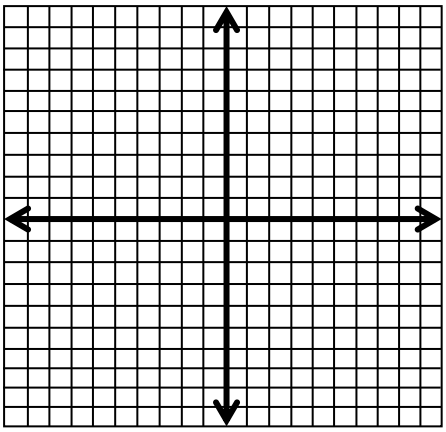
b) Endpoints of the transverse axis: $(-6,0)$&$(6,0)$; asymptote: $y = 3x$



3) Center $(5,-1)$ Focus $(11,-1)$ Vertex $(8,-1)$

Completing the Square: Be sure to factor out first.

4) $4x^2 - 24x - 25y^2 + 250y - 489 = 0$



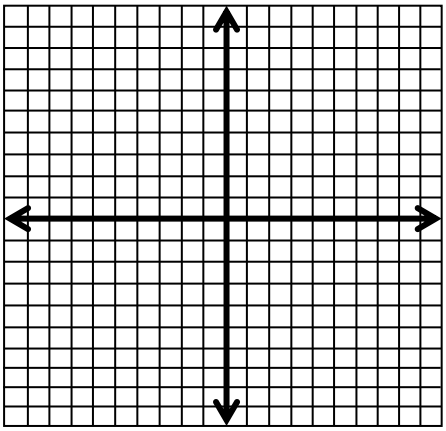
Center:_____Transverse Axis:_____

Vertices:_____

Foci:_____

Asymptote Equation: _____

c) $4x^2 - 24x - 9y^2 - 90y - 153 = 0$



Center:_____Transverse Axis:_____

Vertices:_____

Foci:_____

Asymptote Equation: _____