

9.5: Hyperbolas

“I WILL...

Identify and label all parts of a hyperbola”

I. Definitions

- A. Hyperbola: Set of points whose differences of the distances from any point to the foci is constant. It has two disconnected branches.
- B. Foci: Segment point joining the vertices given at a point. It is always with the **TRANSVERSE** axis
- C. Transverse Axis: The line segment joining the vertices.
- D. Conjugate Axis: The minor line segment joining the vertices perpendicular to the transverse axis.
- E. Asymptote: Line that a graph approaches but does not ever intersect. If the lines intersect, it becomes undefined.
- F. Latus Rectum: A line segment the focus and parallel to the directrix.
- G. Eccentricity: Ratio to describe the shape of the conic $e > 1$

II. Horizontal Standard Form:

- A. Horizontal Standard Form Equation: _____
- B. Foci Points: _____
- C. Asymptotes: _____

III. Vertical Standard Form:

- A. Horizontal Standard Form Equation: _____
- B. Foci Points: _____
- C. Asymptotes: _____

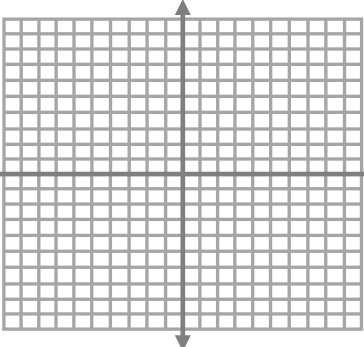
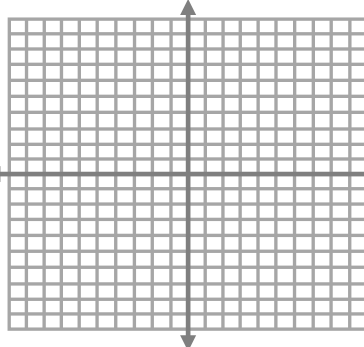
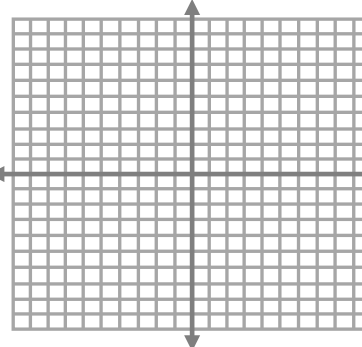
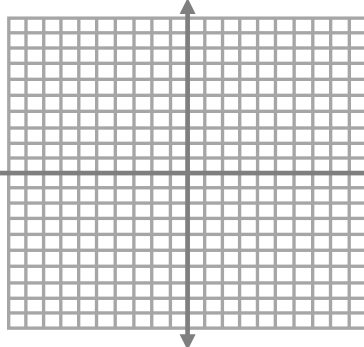
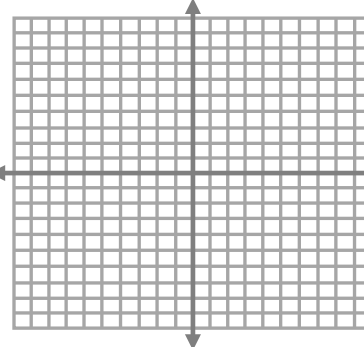
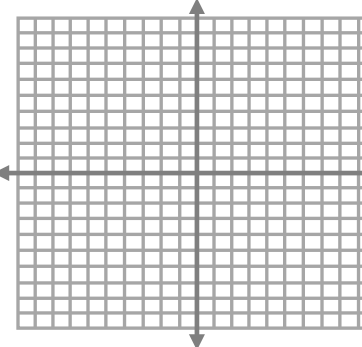
IV. All Standard Form Equations:

- A. Center: (h, k)
- B. Length of Transverse Axis: $2a$
- C. Length of Conjugate Axis: $2b$
- D. Foci Equation: $c^2 = a^2 + b^2$
- E. Length of Latus Rectum: $\frac{2b^2}{a}$
- F. Eccentricity: $\frac{c}{a}$

V. Steps of writing Hyperbola Equations

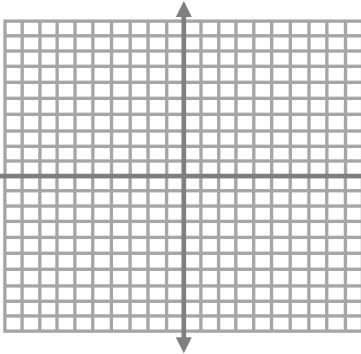
- A. Identify the values of A , B , and C .
- B. Plot/draw the figure with the given information if possible
- C. Write the equation and label the needed information

VI. Model Problems

<p>Ex 1: Graph $\frac{x^2}{25} + \frac{y^2}{4} = 1$</p>  <p>Type: _____ Center: _____ Vertices: _____ CV: _____ Asymptotes: _____ Foci: _____ Latus Rectum: _____ TA: _____ CA: _____ Length of Latus Rectum: _____ Eccentricity: _____</p>	<p>Ex 2: Graph $\frac{y^2}{4} - \frac{x^2}{25} = 1$</p>  <p>Type: _____ Center: _____ Vertices: _____ CV: _____ Asymptotes: _____ Foci: _____ Latus Rectum: _____ TA: _____ CA: _____ Length of Latus Rectum: _____ Eccentricity: _____</p>	<p>Your Turn: Graph $49y^2 - 36x^2 = 1764$</p>  <p>Type: _____ Center: _____ Vertices: _____ CV: _____ Asymptotes: _____ Foci: _____ Latus Rectum: _____ TA: _____ CA: _____ Length of Latus Rectum: _____ Eccentricity: _____</p>
<p>Ex 3: Write an equation of a hyperbola where the foci is $(\pm 3, 0)$ and the vertices are $(\pm 2, 0)$.</p> 	<p>Ex 4: Write an equation where vertices are at $(0, \pm 6)$, asymptote is $y = \pm 6/7x$ and graph.</p> 	<p>Your Turn: Write an equation where center is $(0, 0)$ opens vertically. Points used to make the rectangle are $(0, \pm 4)$ and $(\pm 6, 0)$.</p> 

Ex 5: Graph

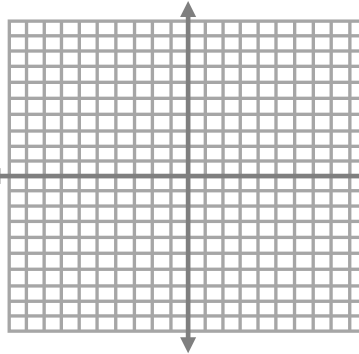
$$\frac{(x-3)^2}{9} - \frac{(y-2)^2}{4} = 1$$



Type: _____
 Center: _____
 Vertices: _____
 CV: _____
 Asymptotes: _____
 Foci: _____
 Latus Rectum: _____
 TA: _____ CA: _____
 Length of Latus Rectum: _____
 Eccentricity: _____

Ex 6: Graph

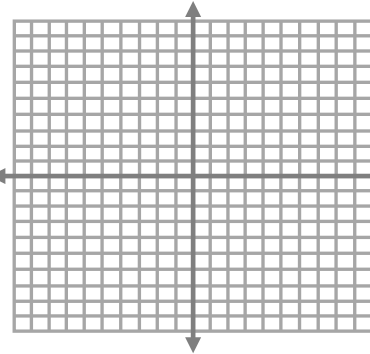
$$\frac{(y-3)^2}{4} - \frac{(x+2)^2}{6} = 1$$



Type: _____
 Center: _____
 Vertices: _____
 CV: _____
 Asymptotes: _____
 Foci: _____
 Latus Rectum: _____
 TA: _____ CA: _____
 Length of Latus Rectum: _____
 Eccentricity: _____

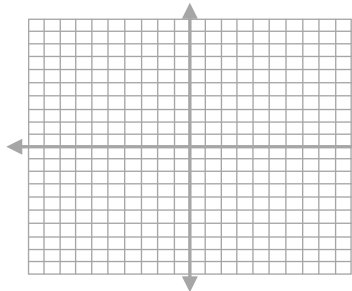
Your Turn: Graph

$$\frac{(y-3)^2}{49} - \frac{(x+1)^2}{25} = 1$$

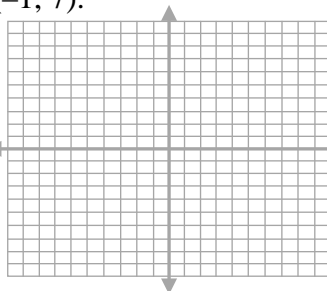


Type: _____
 Center: _____
 Vertices: _____
 CV: _____
 Asymptotes: _____
 Foci: _____
 Latus Rectum: _____
 TA: _____ CA: _____
 Length of Latus Rectum: _____
 Eccentricity: _____

Ex 7: Write an equation where the foci coordinates are (6, 2) & (-8, 2) and vertices are (2, 2) & (-4, 2).



Ex 8: Write an equation where center is (-3, 7), foci coordinates are $(-3 \pm \sqrt{85}, 7)$ and vertices are $(-5, 7)$ & $(-1, 7)$.



Your Turn: Write an equation where center is (1, -2), foci coordinates are $(1 \pm \sqrt{5}, -2)$ and vertices are (3, -2) & (-1, -2).

