

9.4: Ellipses

“I WILL...

Identify and label all parts of an ellipse

Convert all general form equations to standard form”

I. Definitions

- A. Ellipse: Set of points whose sum of the distances from two fixed points is consistent
- B. Foci: Segment point joining the vertices given at a point. It is always with the MAJOR axis
- C. Major Axis: The longer line segment of the two segments
- D. Minor Axis: The smaller line segment of the two segments
- E. Vertices: Endpoints of the major axis
- F. Co-Vertices: Endpoints of the minor axis
- G. Latus Rectum: A line segment through the foci of the shape in which it is perpendicular through the major axis and endpoints of the ellipse
- H. Eccentricity: Ratio to describe the shape of the conic, $0 < e < 1$

II. Horizontal Standard Form:

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

III. Steps of Constant Sum

- A. Apply into the equation $d = PF_1 + PF_2$
- B. Determine the distance using the Distance Formula of the points,
$$d = \sqrt{(x_1 - x_3)^2 + (y_1 - y_3)^2} + \sqrt{(x_2 - x_3)^2 + (y_2 - y_3)^2}$$
- C. Simplify and Solve
- D. One property of an ellipse is that, from any point, the sum of the distances to the two foci is constant.

IV. Vertical Standard Form:

- A. Vertical Standard Form Equation: _____
- B. Foci Points: _____

V. All Standard Form Equations:

- A. Center: (h, k)
- B. Length of Major Axis: $2a$
- C. Length of Minor Axis: $2b$
- D. Foci Equation: $c^2 = a^2 - b^2$

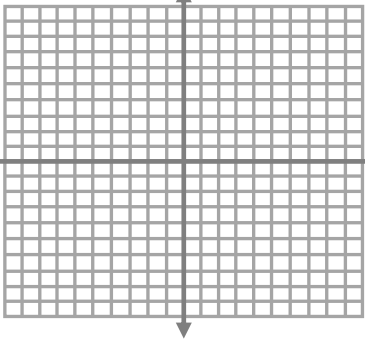
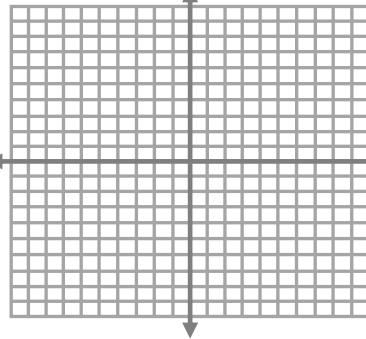
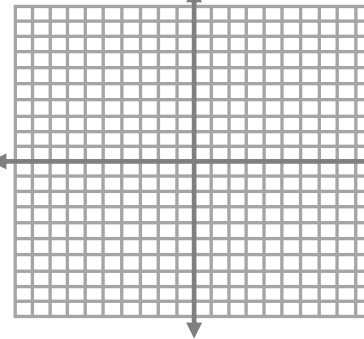
E. Length of Latus Rectum: $\frac{2b^2}{a}$

F. Eccentricity: $\frac{c}{a}$

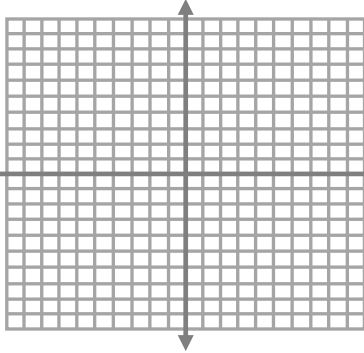
VI. Steps of writing Ellipse Equations

- 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

VII. Model Problems

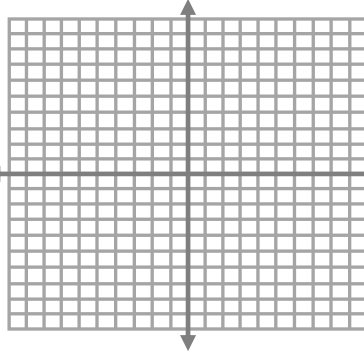
<p>Ex 1: Find the constant sum for an ellipse with foci F_1 (3, 0) and F_2 (24, 0) and the point on the ellipse (9, 8).</p>	<p>Ex 2: Find the constant sum for an ellipse with foci F_1 (0, 3) and F_2 (0, -3) and the point on the ellipse (10, 0).</p>	<p>Your Turn: Find the constant sum for an ellipse with foci F_1 (0, -8) and F_2 (0, 8) and the point on the ellipse (0, 10).</p>
<p>Ex 3: Graph $\frac{x^2}{25} - \frac{y^2}{4} = 1$</p>  <p>Type: _____ Center: _____ Vertices: _____ CV: _____ Foci: _____ Latus Rectum: _____ Major: _____ Minor: _____ Length of Latus Rectum: _____ Eccentricity: _____</p>	<p>Ex 4: Graph $16x^2 + 4y^2 = 64$</p>  <p>Type: _____ Center: _____ Vertices: _____ CV: _____ Foci: _____ Latus Rectum: _____ Major: _____ Minor: _____ Length of Latus Rectum: _____ Eccentricity: _____</p>	<p>Your Turn: Graph $\frac{x^2}{49} + \frac{y^2}{81} = 1$</p>  <p>Type: _____ Center: _____ Vertices: _____ CV: _____ Foci: _____ Latus Rectum: _____ Major: _____ Minor: _____ Length of Latus Rectum: _____ Eccentricity: _____</p>

Ex 5: Write an equation in standard form for an ellipse with center (0, 0), vertex at (6, 0) and co-vertex at (0, 4).



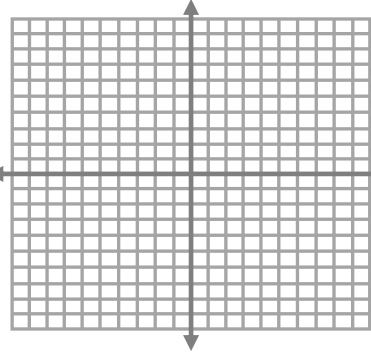
Equ.: _____

Ex 6: Write an equation in standard form for an ellipse with center (0, 0), vertices at $(\pm 5, 0)$ and co-vertices at $(0, \pm 3)$.



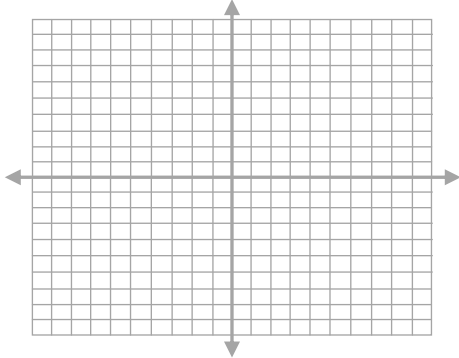
Equ.: _____

Your Turn: Write an equation in standard form for an ellipse with center (0, 0), vertex at (0, 9) and co-vertex at (5, 0).

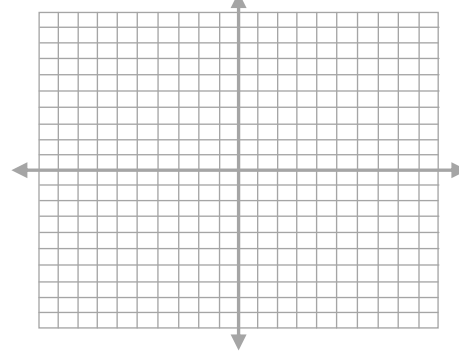


Equ.: _____

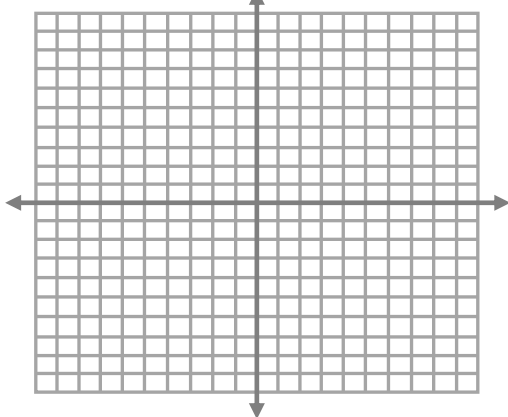
Ex 7: An ellipse has its center located in the origin. Find the equation where the foci points are at $(\pm 8, 0)$, length of minor axis is 4 units long and graph.



Your Turn: An ellipse has its center at the origin. Find an equation of the ellipse with the ends of the major axis points at $(0, \pm 5)$, and the foci of $(0, \pm 4)$.



Ex 8: Graph $\frac{(x+6)^2}{9} + \frac{(y-5)^2}{4} = 1$



Vertices: _____

CV: _____

Foci: _____

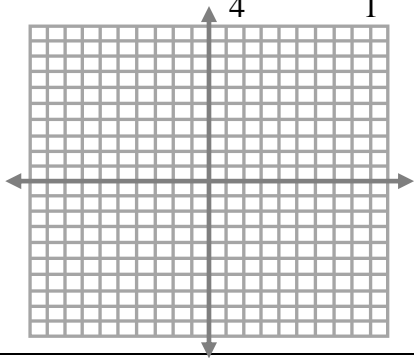
Latus Rectum: _____

Major: _____ Minor: _____

Length of Latus Rectum: _____

Eccentricity: _____

Your Turn: Graph $\frac{(x-2)^2}{4} + \frac{(y+1)^2}{1} = 1$



Vertices: _____

CV: _____

Foci: _____

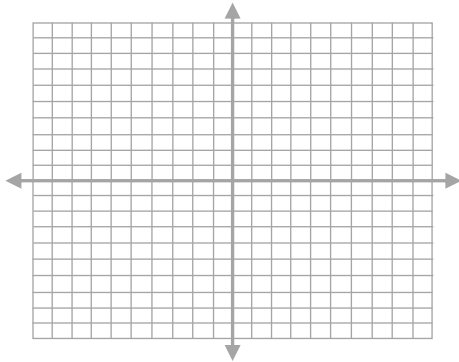
Latus Rectum: _____

Major: _____ Minor: _____

Length of Latus Rectum: _____

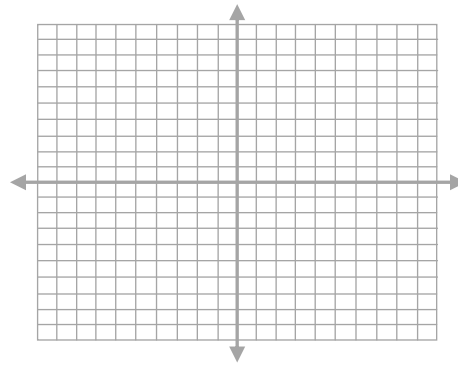
Eccentricity: _____

Ex 9: An ellipse with the center of $(-3, 5)$ has vertices at $(-3, 10)$ and $(-3, 0)$ and its foci is at $(-3, 8)$ and $(-3, 2)$. Determine the equation.



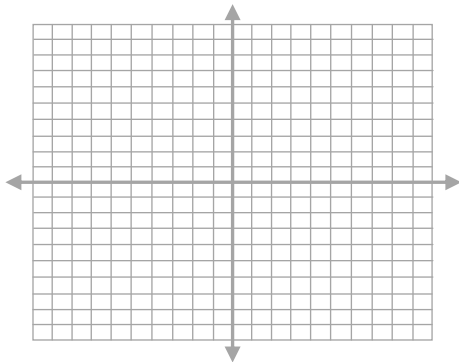
Equ.: _____

Ex 10: A conic has foci points of $(0, 0)$ and $(4, 0)$. The major axis length is 8. Determine the equation.



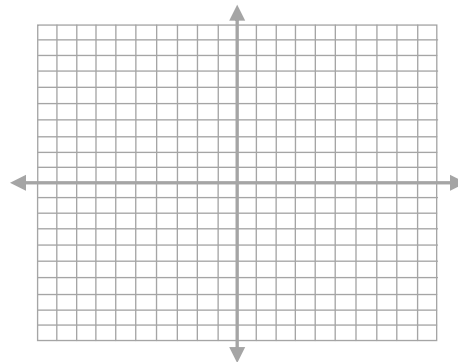
Equ.: _____

Ex 11: A conic has the vertices at $(5, 0)$ and $(5, 12)$. The endpoints of the minor axis are at $(1, 6)$ and $(9, 6)$. Determine the equation.



Equ.: _____

Your Turn: A conic has the co-vertices at $(2, 3)$ and $(2, 1)$. The length of the major axis is 4. Determine the equation.



Equ.: _____