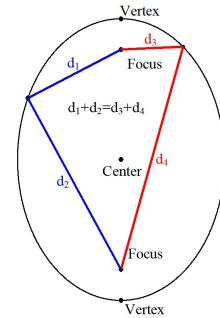
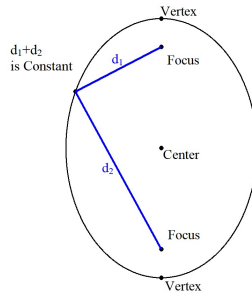


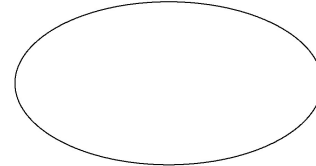
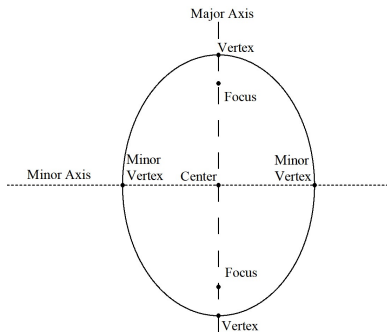
7.3 The Ellipse

▼ Geometric Definition of an Ellipse

An **ellipse** is a collection of all points in the plane, the sum of whose distances from two fixed points called the foci is a constant.



▼ Vocabulary of an Ellipse



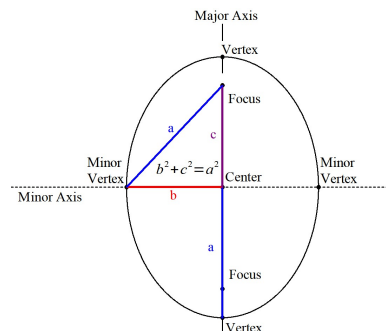
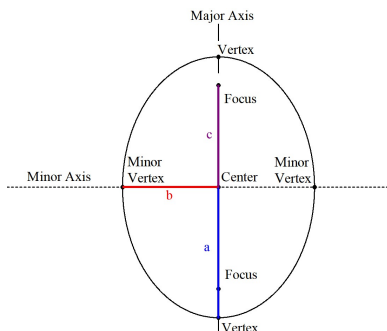
▼ Important Components of the Equation

a : distance from center to vertex

c : distance from center to focus

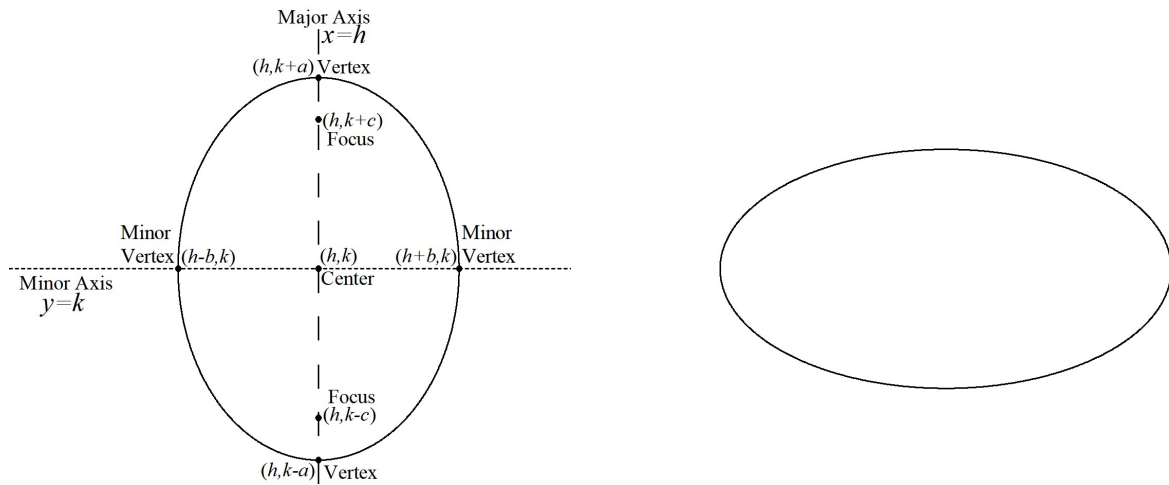
b : distance from center to minor vertex

Related by Pythagorean theorem.



▼ Labeling the Ordered Pairs and Equations

When you know the center, a , b and c you can find all of the significant features of the ellipse.



▼ Equations of an ellipse with center at the origin $(0, 0)$.

Major Axis is Horizontal ($y = 0$)

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1;$$

$$b^2 + c^2 = a^2$$

Major Axis is Vertical ($x = 0$)

$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1;$$

$$b^2 + c^2 = a^2$$

▼ Equations of an ellipse with center at (h, k) .

Major Axis is Horizontal ($y = k$)

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

$$b^2 + c^2 = a^2$$

Major Axis is Vertical ($x = h$)

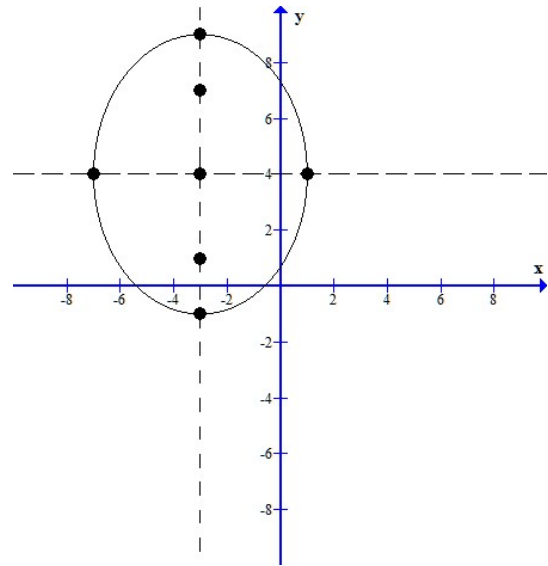
$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1;$$

$$b^2 + c^2 = a^2$$

▼ Examples: Given the graph find the features and equation

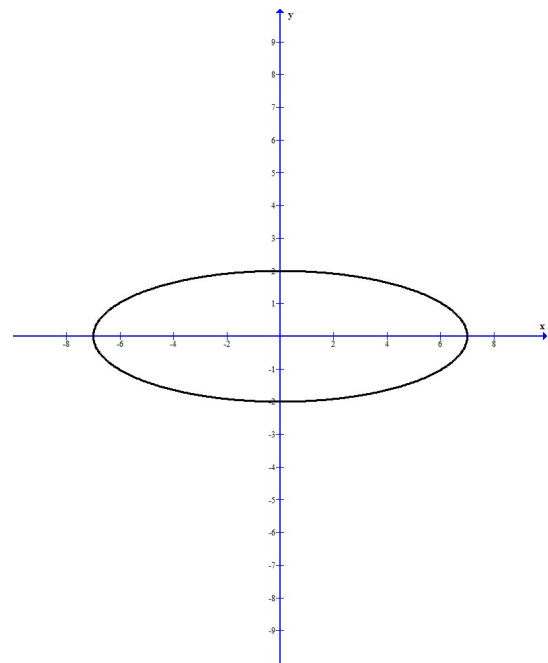
▼ Example 1:

Find the equation of the ellipse, the center, vertices, foci, major axis, minor axis



▼ Example 2:

Find the equation of the ellipse, the center, vertices, foci, major axis, minor axis



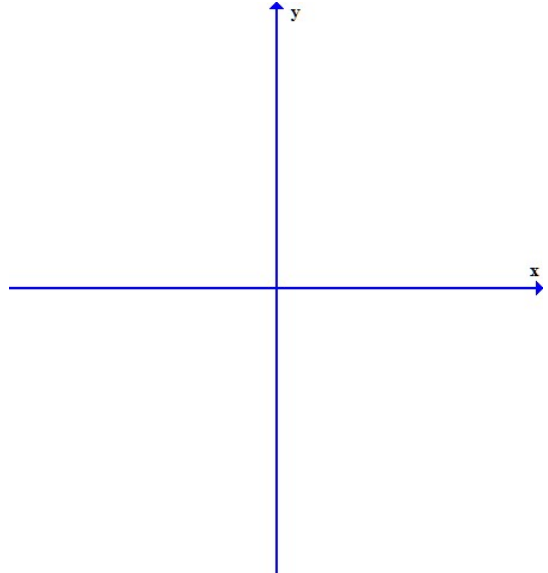
▼ Examples: Given the features find the equation and the graph

▼ Example 1:

Find the orientation, center, vertices, and write the equation of the ellipse.

Graph the Ellipse

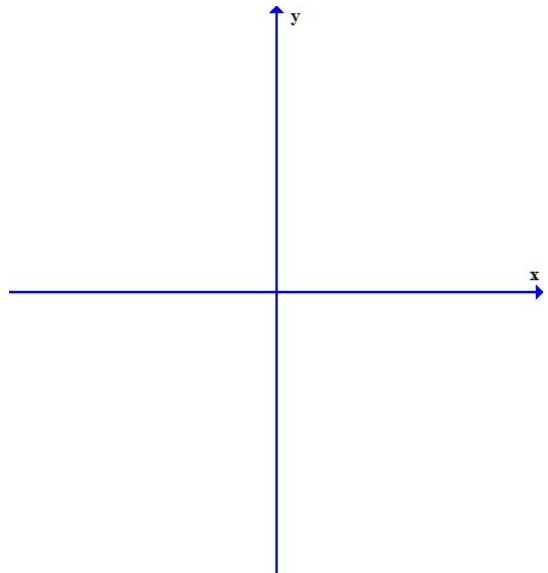
The foci is $(0, \pm 2)$ and the length of the major axis is 8.



▼ Example 2:

Find the orientation, center, vertices, and write the equation of the ellipse.

The center is at $(2, 1)$; One vertex is at $(7, 1)$; One focus is at $(-1, 1)$.

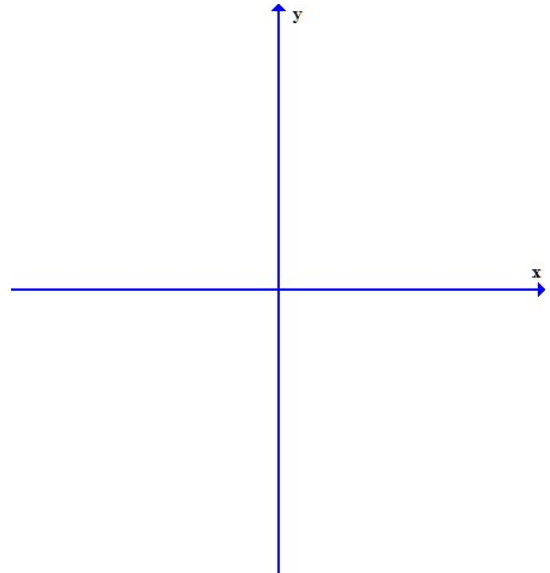


▼ Examples: Given the equations find the features and graph

▼ Example 1:

Find the orientation, center, vertices, and graph of the ellipse.

$$\frac{(x - 3)^2}{16} + \frac{(y + 4)^2}{49} = 1$$



▼ Example 2:

Rewrite using completing the square. Find the orientation, center, vertices, and graph of the ellipse.

$$x^2 - 2x + 16y^2 + 32y + 1 = 0$$

