

10.4b Ellipse with center (h, k)

Horizontal Ellipse

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

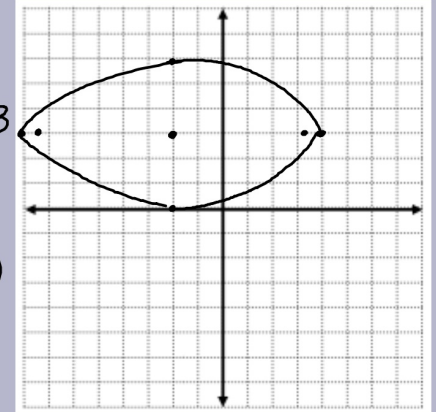
Vertical Ellipse

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

Find the center, foci, vertices, co-vertices, and lengths of the major and minor axis of each ellipse whose equation is given. Then draw the graph.

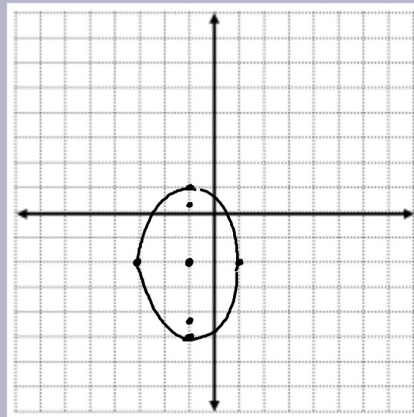
$$\frac{(x+2)^2}{36} + \frac{(y-3)^2}{9} = 1$$

horizontal $a = \pm 6$ $b = \pm 3$
 center $(-2, 3)$ maj 12
 foci $c^2 = 36 - 9$ min 6
 $c^2 = 27$
 $c = \pm 3\sqrt{3}$ $(-2 \pm 3\sqrt{3}, 3)$
 vertices $(4, 3)$ $(-8, 3)$
 co-vert $(-2, 6)$ $(-2, 0)$



Find the center, foci, vertices, co-vertices, and lengths of the major and minor axis of each ellipse whose equation is given. Then draw the graph. $\frac{(x+1)^2}{4} + \frac{(y+2)^2}{9} = 1$

vertical $a = \pm 3$ $b = \pm 2$
 center $(-1, -2)$
 vertices $(-1, 1)$ and $(-1, -5)$
 co-vert. $(1, -2)$ and $(-3, -2)$
 major 6 minor 4
 foci $c^2 = a^2 - b^2$
 $c^2 = 9 - 4$
 $c = \pm\sqrt{5}$ $(-1, -2 \pm \sqrt{5})$



Write the equation of the following ellipse. Vertices at $(3, 3)$ and $(3, -9)$. The foci are at $(3, 2.2)$ and $(3, -8.2)$

$$3 - (-9) = \frac{12}{2} = 6 = a \quad a^2 = 36$$

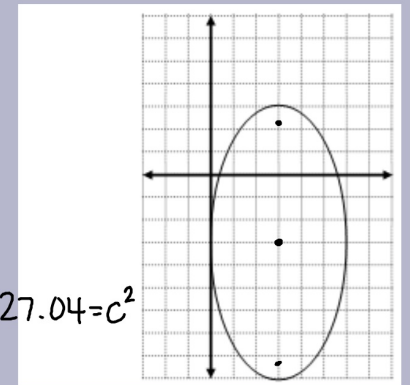
$$3 - 6 = -3 \quad (3, -3) \text{ center}$$

$$\frac{(x-3)^2}{8.96} + \frac{(y+3)^2}{36} = 1$$

$$2.2 - -8.2 = \frac{10.4}{2} = 5.2 = c \quad 27.04 = c^2$$

$$27.04 = 36 - b^2$$

$$8.96 = b^2$$



The write the equation of the ellipse with the center is at (4, 3). The major axis is 14 unit long and parallel to the x-axis. The minor axis is 6 units long.

$$\begin{array}{llll} \text{major} & 14 & a = 7 & a^2 = 49 \\ \text{minor} & 6 & b = 3 & b^2 = 9 \end{array}$$

$$\frac{(x-4)^2}{49} + \frac{(y-3)^2}{9} = 1$$