

10-4 Study Guide and Intervention *(continued)*

Ellipses

Graph Ellipses To graph an ellipse, if necessary, write the given equation in the standard form of an equation for an ellipse.

$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1 \text{ (for ellipse with major axis horizontal) or}$$

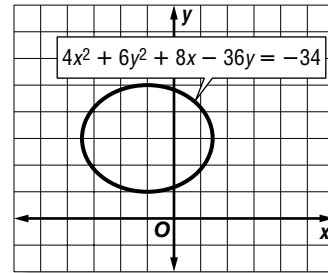
$$\frac{(y - k)^2}{a^2} + \frac{(x - h)^2}{b^2} = 1 \text{ (for ellipse with major axis vertical)}$$

Use the center (h, k) and the endpoints of the axes to plot four points of the ellipse. To make a more accurate graph, use a calculator to find some approximate values for x and y that satisfy the equation.

Example

Graph the ellipse $4x^2 + 6y^2 + 8x - 36y = -34$.

$$\begin{aligned} 4x^2 + 6y^2 + 8x - 36y &= -34 \\ 4x^2 + 8x + 6y^2 - 36y &= -34 \\ 4(x^2 + 2x + \blacksquare) + 6(y^2 - 6y + \blacksquare) &= -34 + \blacksquare \\ 4(x^2 + 2x + 1) + 6(y^2 - 6y + 9) &= -34 + 58 \\ 4(x + 1)^2 + 6(y - 3)^2 &= 24 \\ \frac{(x + 1)^2}{6} + \frac{(y - 3)^2}{4} &= 1 \end{aligned}$$



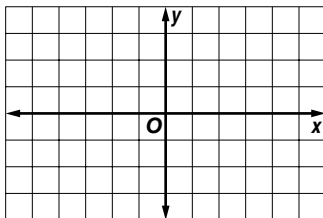
The center of the ellipse is $(-1, 3)$. Since $a^2 = 6$, $a = \sqrt{6}$. Since $b^2 = 4$, $b = 2$.

The length of the major axis is $2\sqrt{6}$, and the length of the minor axis is 4. Since the x -term has the greater denominator, the major axis is horizontal. Plot the endpoints of the axes. Then graph the ellipse.

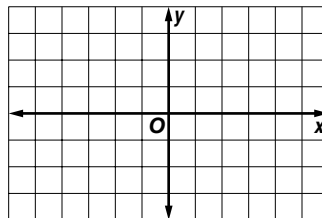
Exercises

Find the coordinates of the center and the lengths of the major and minor axes for the ellipse with the given equation. Then graph the ellipse.

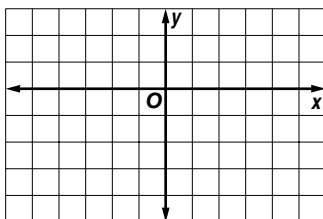
1. $\frac{y^2}{12} + \frac{x^2}{9} = 1$



2. $\frac{x^2}{25} + \frac{y^2}{4} = 1$



3. $x^2 + 4y^2 + 24y = -32$



4. $9x^2 + 6y^2 - 36x + 12y = 12$

