Lesson 8.2 • Circles and Ellipses

1. Find the center and radius of each circle.
   a. \( x^2 + y^2 = 16 \)  
      \( (0,0) \) \( r = 4 \)
   b. \( (x - 3)^2 + y^2 = 100 \)  
      \( (3,0) \) \( r = 10 \)
   c. \( (x - 0.5)^2 + (y + 0.5)^2 = 0.25 \)  
      \( (0.5, -0.5) \) \( r = 0.5 \)
   d. \( (x + \frac{1}{3})^2 + (y - \frac{2}{3})^2 = \frac{25}{49} \)  
      \( (-\frac{1}{3}, \frac{2}{3}) \) \( r = \frac{5}{7} \)

2. Find the center, horizontal scale factor, and vertical scale factor for each ellipse.
   a. \( \left(\frac{x}{3}\right)^2 + \left(\frac{y}{5}\right)^2 = 1 \)  
      \( (0,0) \) \( H_0 = 3 \) \( V_0 = 5 \)
   b. \( \left(\frac{x - 2}{4}\right)^2 + \left(\frac{y}{2}\right)^2 = 1 \)  
      \( (2,0) \) \( H_0 = 4 \) \( V_0 = 2 \)
   c. \( \frac{(x + 5)^2}{9} + \frac{(y - 4)^2}{25} = 1 \)  
      \( (-5, 4) \) \( H_0 = 3 \) \( V_0 = 5 \)

3. Sketch each ellipse in Exercise 2. Give the exact coordinates of the endpoints of the major and minor axes, and the foci.

4. Write an equation in standard form for each graph.
   a. \( \left(\frac{x - 2}{2}\right)^2 + \left(\frac{y + 1}{2}\right)^2 = 1 \)
   b. \( \left(\frac{x}{3}\right)^2 + \left(\frac{y}{4}\right)^2 = 1 \)
   c. \( \left(\frac{x - 4}{1}\right)^2 + \left(\frac{y - 2}{4}\right)^2 = 1 \)
Lesson 8.3 • Parabolas

1. For each parabola described, use the information given to find the location of the missing feature. It may help to draw a sketch.
   a. If the vertex is (0, 0) and the focus is (4, 0), where is the directrix?

   b. If the vertex is (5, 0) and the directrix is $x = 1.5$, where is the focus?

   c. If the focus is $(2, -3)$ and the directrix is $x = -1$, where is the vertex?

2. Find the vertex of each parabola and state whether the parabola opens upward, downward, to the right, or to the left. Also give the equation of the axis of symmetry.
   a. $y = x^2 - 5$
      \[ (0, -5) \] upward
      \[ x = 0 \]
      \[ (0, 3) \] left
      \[ y = 3 \]
   b. $y = -4x^2$
      \[ (0, 0) \] downward
      \[ x = 0 \]
   c. $x = 2y^2 + 1$
      \[ (1, 0) \] right
      \[ y = 0 \]
   d. $x = -(y - 3)^2$
      \[ (-1, -2) \] downward
      \[ x = -1 \]
   e. $y + 2 = -(x + 1)^2$
      \[ (-5, 4) \] right
      \[ y = 4 \]
   f. $\left(\frac{y - 4}{2}\right)^2 = \frac{x + 5}{4}$

3. Write an equation in standard form for each parabola.
   a. $\left(\frac{y + 3}{2}\right)^2 = \left(\frac{x - 2}{1}\right)^2$
   b. $x = (y - 3)^2$
   c. $\frac{y - 2}{1} = \left(\frac{x - 1}{4}\right)^2$
   d. $y - \frac{y - 2}{2} = \frac{x^2}{16}$
      \[ -\frac{16(y - 2)}{2} = x^2 \]
      \[ -8(y - 2) = x^2 \]
      \[ y - \frac{2}{2} = \frac{x^2}{16} \]