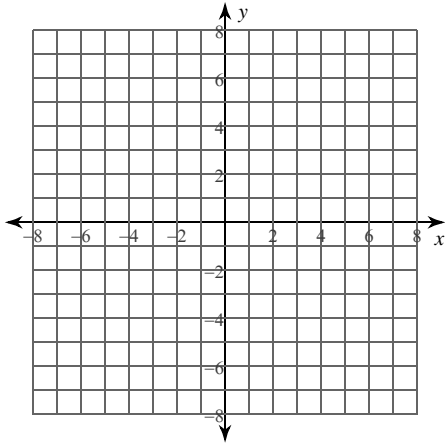


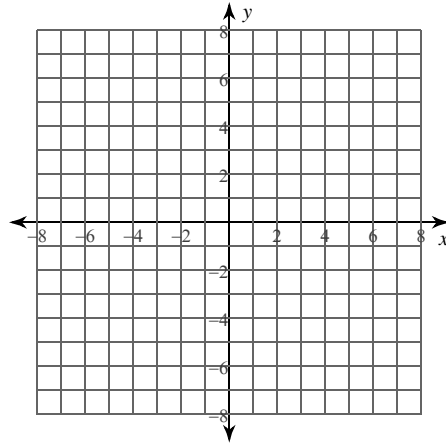
## Ellipses

Identify the center, vertices, co-vertices, and foci of each. Then sketch the graph.

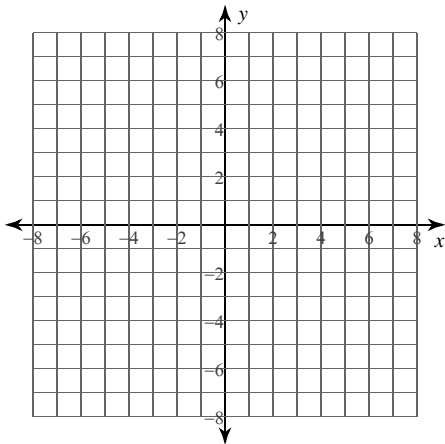
$$1) \frac{(x+3)^2}{16} + \frac{(y-1)^2}{4} = 1$$



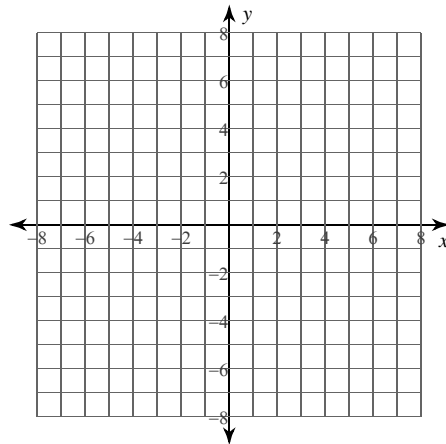
$$2) \frac{(x-3)^2}{5} + \frac{(y-1)^2}{15} = 1$$



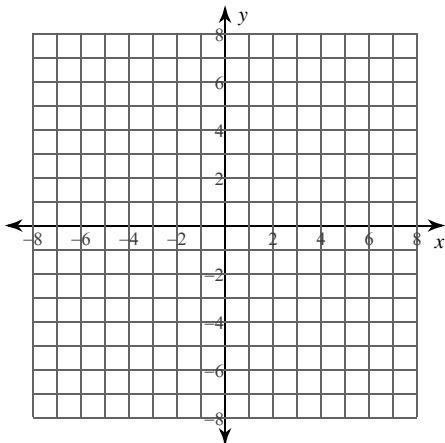
$$3) \frac{(x-1)^2}{9} + \frac{(y+5)^2}{4} = 1$$



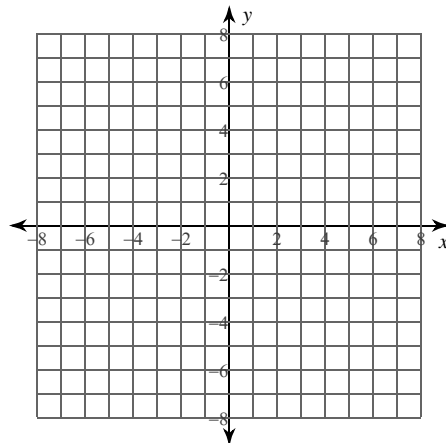
$$4) \frac{x^2}{49} + \frac{(y-3)^2}{9} = 1$$



$$5) x^2 + 9y^2 + 6x - 90y + 225 = 0$$



$$6) 9x^2 + 4y^2 - 36x + 24y + 36 = 0$$



**Identify the center, vertices, co-vertices, foci, length of the major axis, length of the minor axis, length of the latus rectum, and eccentricity of each.**

7)  $3x^2 + 35y^2 - 60x + 140y - 85 = 0$

8)  $36x^2 + 5y^2 - 90y - 495 = 0$

**Use the information provided to write the standard form equation of each ellipse.**

9) Vertices:  $(6, -6), (-10, -6)$   
Foci:  $(-2 + 2\sqrt{7}, -6), (-2 - 2\sqrt{7}, -6)$

10) Vertices:  $(13, 9), (-3, 9)$   
Foci:  $(5 + 2\sqrt{7}, 9), (5 - 2\sqrt{7}, 9)$

11) Vertices:  $(5, 9), (-13, 9)$   
Co-vertices:  $(-4, 14), (-4, 4)$

12) Foci:  $(3, 10 + \sqrt{105}), (3, 10 - \sqrt{105})$   
Co-vertices:  $(11, 10), (-5, 10)$

13) Foci:  $\left(\frac{4\sqrt{35} + 7}{2}, \frac{3}{2}\right), \left(\frac{-4\sqrt{35} + 7}{2}, \frac{3}{2}\right)$   
Endpoints of minor axis:  $\left(\frac{7}{2}, \frac{7}{2}\right), \left(\frac{7}{2}, -\frac{1}{2}\right)$

14) Center:  $(-8, 5)$   
Vertex:  $(-8, 15)$   
Focus:  $(-8, 5 + \sqrt{51})$

15) Endpoints of major axis:  
 $(-4, -6), (-16, -6)$

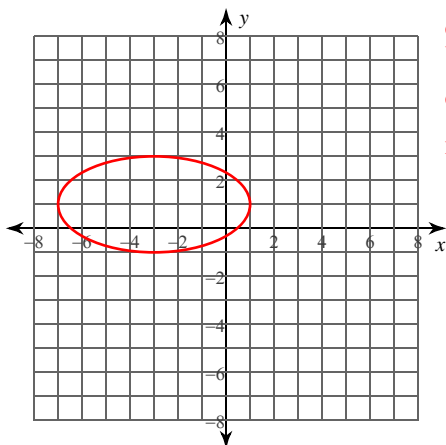
Endpoints of minor axis:  
 $(-10, -2), (-10, -10)$

16) Eccentricity =  $\frac{\sqrt{15}}{4}$   
Center:  $(-5, 5)$   
Co-vertex:  $(-8, 5)$

## Ellipses

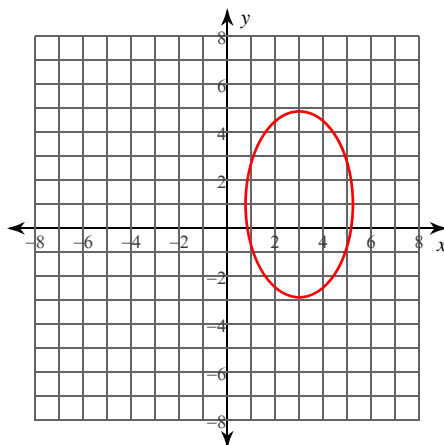
Identify the center, vertices, co-vertices, and foci of each. Then sketch the graph.

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



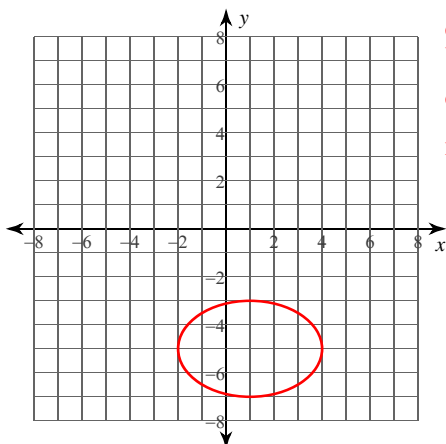
Center:  $(-3, 1)$   
 Vertices:  $(1, 1)$   
 $(-7, 1)$   
 Co-vertices:  $(-3, 3)$   
 $(-3, -1)$   
 Foci:  $(-3 + 2\sqrt{3}, 1)$   
 $(-3 - 2\sqrt{3}, 1)$

$$2) \frac{(x-3)^2}{5} + \frac{(y-1)^2}{15} = 1$$



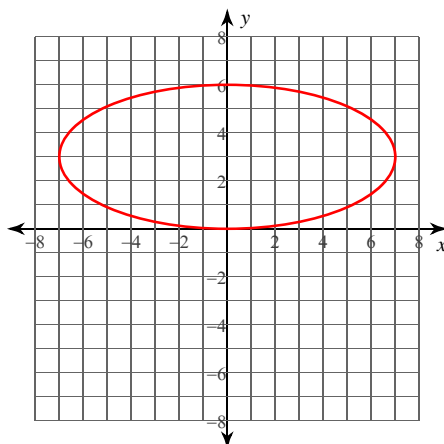
Center:  $(3, 1)$   
 Vertices:  $(3, 1 + \sqrt{15})$   
 $(3, 1 - \sqrt{15})$   
 Co-vertices:  $(3 + \sqrt{5}, 1)$   
 $(3 - \sqrt{5}, 1)$   
 Foci:  $(3, 1 + \sqrt{10})$   
 $(3, 1 - \sqrt{10})$

$$3) \frac{(x-1)^2}{9} + \frac{(y+5)^2}{4} = 1$$



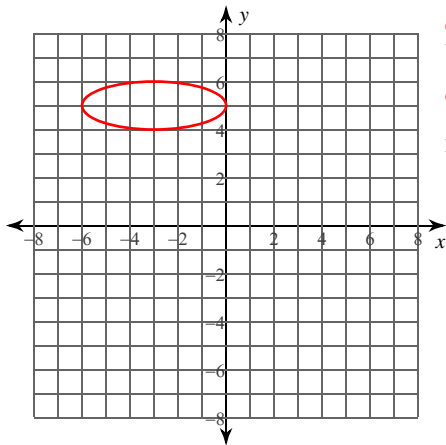
Center:  $(1, -5)$   
 Vertices:  $(4, -5)$   
 $(-2, -5)$   
 Co-vertices:  $(1, -3)$   
 $(1, -7)$   
 Foci:  $(1 + \sqrt{5}, -5)$   
 $(1 - \sqrt{5}, -5)$

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



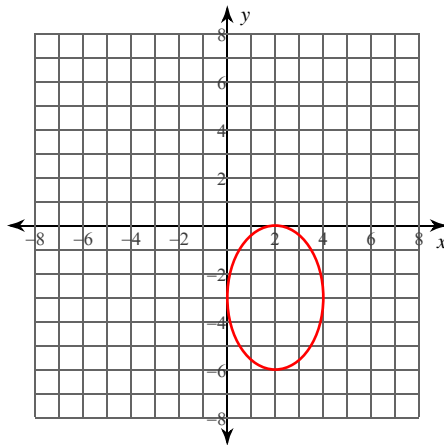
Center:  $(0, 3)$   
 Vertices:  $(7, 3)$   
 $(-7, 3)$   
 Co-vertices:  $(0, 6)$   
 $(0, 0)$   
 Foci:  $(2\sqrt{10}, 3)$   
 $(-2\sqrt{10}, 3)$

$$5) x^2 + 9y^2 + 6x - 90y + 225 = 0$$



Center:  $(-3, 5)$   
 Vertices:  $(0, 5)$   
 $(-6, 5)$   
 Co-vertices:  $(-3, 6)$   
 $(-3, 4)$   
 Foci:  $(-3 + 2\sqrt{2}, 5)$   
 $(-3 - 2\sqrt{2}, 5)$

$$6) 9x^2 + 4y^2 - 36x + 24y + 36 = 0$$



Center:  $(2, -3)$   
 Vertices:  $(2, 0)$   
 $(2, -6)$   
 Co-vertices:  $(4, -3)$   
 $(0, -3)$   
 Foci:  $(2, -3 + \sqrt{5})$   
 $(2, -3 - \sqrt{5})$

**Identify the center, vertices, co-vertices, foci, length of the major axis, length of the minor axis, length of the latus rectum, and eccentricity of each.**

7)  $3x^2 + 35y^2 - 60x + 140y - 85 = 0$

Center:  $(10, -2)$

Vertices:  $(10 + 5\sqrt{7}, -2), (10 - 5\sqrt{7}, -2)$

Co-vertices:  $(10, -2 + \sqrt{15}), (10, -2 - \sqrt{15})$

Foci:  $(10 + 4\sqrt{10}, -2), (10 - 4\sqrt{10}, -2)$

Major Axis:  $10\sqrt{7}$  units

Minor Axis:  $2\sqrt{15}$  units

Latus Rectum:  $\frac{6\sqrt{7}}{7}$  units

Eccentricity:  $\frac{4\sqrt{70}}{35} \approx 0.956$

8)  $36x^2 + 5y^2 - 90y - 495 = 0$

Center:  $(0, 9)$

Vertices:  $(0, 9 + 6\sqrt{5}), (0, 9 - 6\sqrt{5})$

Co-vertices:  $(5, 9), (-5, 9)$

Foci:  $(0, 9 + \sqrt{155}), (0, 9 - \sqrt{155})$

Major Axis:  $12\sqrt{5}$  units

Minor Axis: 10 units

Latus Rectum:  $\frac{5\sqrt{5}}{3}$  units

Eccentricity:  $\frac{\sqrt{31}}{6} \approx 0.928$

**Use the information provided to write the standard form equation of each ellipse.**

9) Vertices:  $(6, -6), (-10, -6)$

Foci:  $(-2 + 2\sqrt{7}, -6), (-2 - 2\sqrt{7}, -6)$

$$\frac{(x+2)^2}{64} + \frac{(y+6)^2}{36} = 1$$

10) Vertices:  $(13, 9), (-3, 9)$

Foci:  $(5 + 2\sqrt{7}, 9), (5 - 2\sqrt{7}, 9)$

$$\frac{(x-5)^2}{64} + \frac{(y-9)^2}{36} = 1$$

11) Vertices:  $(5, 9), (-13, 9)$

Co-vertices:  $(-4, 14), (-4, 4)$

$$\frac{(x+4)^2}{81} + \frac{(y-9)^2}{25} = 1$$

12) Foci:  $(3, 10 + \sqrt{105}), (3, 10 - \sqrt{105})$

Co-vertices:  $(11, 10), (-5, 10)$

$$\frac{(x-3)^2}{64} + \frac{(y-10)^2}{169} = 1$$

13) Foci:  $\left(\frac{4\sqrt{35} + 7}{2}, \frac{3}{2}\right), \left(\frac{-4\sqrt{35} + 7}{2}, \frac{3}{2}\right)$

Endpoints of minor axis:  $\left(\frac{7}{2}, \frac{7}{2}\right), \left(\frac{7}{2}, -\frac{1}{2}\right)$

$$\frac{\left(x - \frac{7}{2}\right)^2}{144} + \frac{\left(y - \frac{3}{2}\right)^2}{4} = 1$$

14) Center:  $(-8, 5)$

Vertex:  $(-8, 15)$

Focus:  $(-8, 5 + \sqrt{51})$

$$\frac{(x+8)^2}{49} + \frac{(y-5)^2}{100} = 1$$

15) Endpoints of major axis:

$(-4, -6), (-16, -6)$

Endpoints of minor axis:

$(-10, -2), (-10, -10)$

$$\frac{(x+10)^2}{36} + \frac{(y+6)^2}{16} = 1$$

16) Eccentricity =  $\frac{\sqrt{15}}{4}$

Center:  $(-5, 5)$

Co-vertex:  $(-8, 5)$

$$\frac{(x+5)^2}{9} + \frac{(y-5)^2}{144} = 1$$