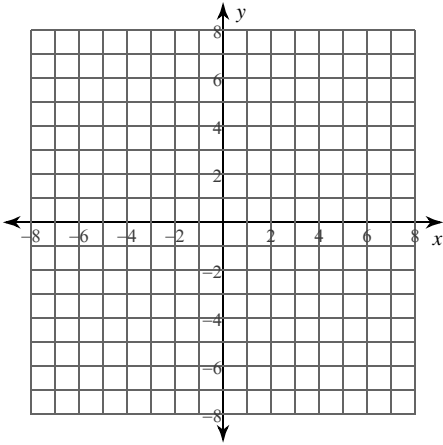


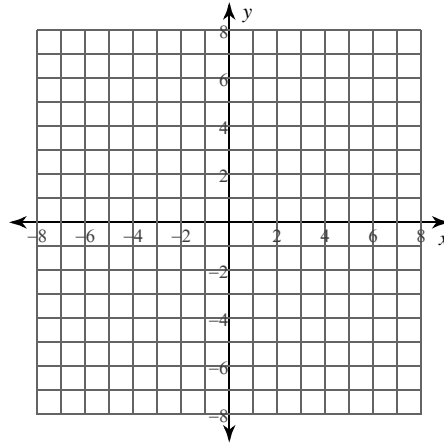
Ellipses

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

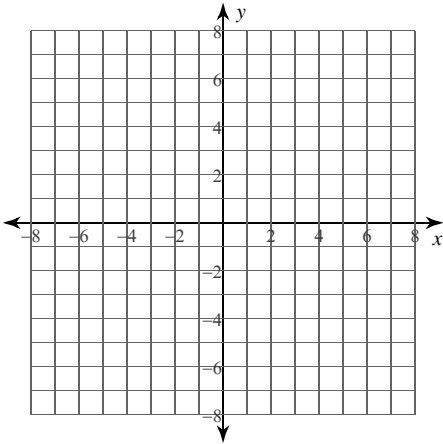
$$1) \frac{(x+3)^2}{16} + \frac{(y-1)^2}{4} = 1$$



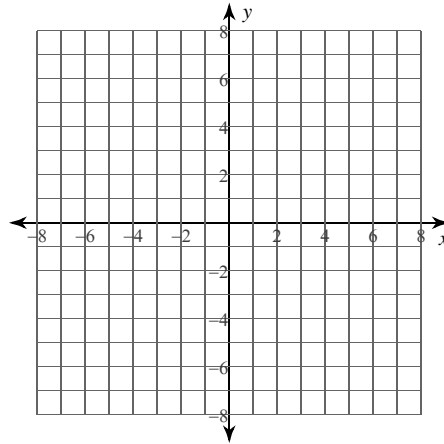
$$2) \frac{(x-3)^2}{5} + \frac{(y-1)^2}{15} = 1$$



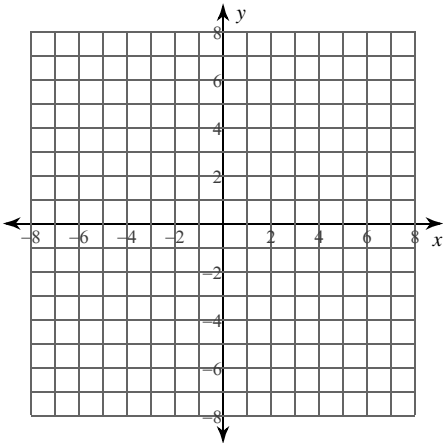
$$3) \frac{(x-1)^2}{9} + \frac{(y+5)^2}{4} = 1$$



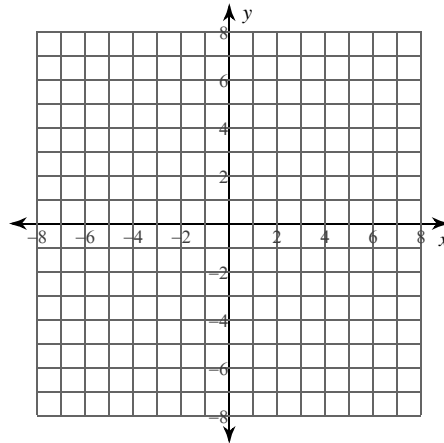
$$4) \frac{x^2}{49} + \frac{(y-3)^2}{9} = 1$$



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



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



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

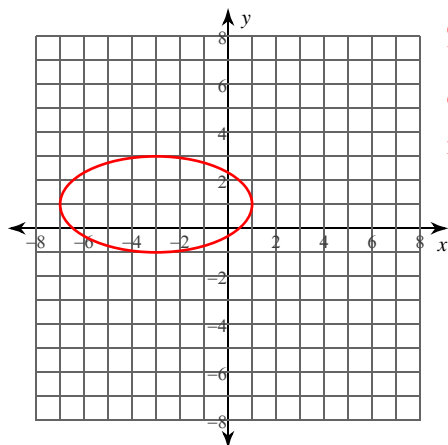
Endpoints of minor axis:
 $(-10, -2), (-10, -10)$

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

Ellipses

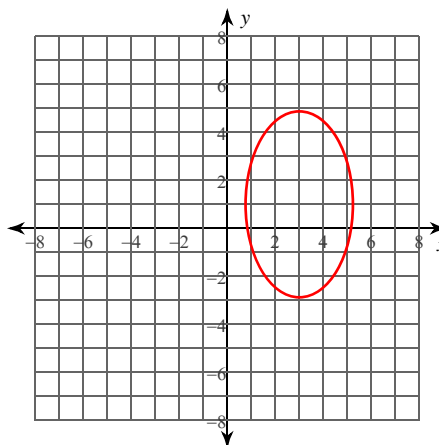
Identify the center, vertices, co-vertices, and foci of each. Then sketch the graph.

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



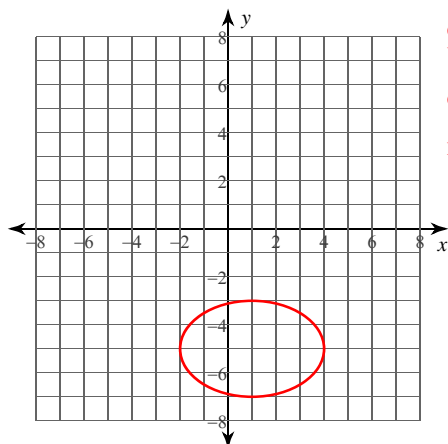
Center: $(-3, 1)$
 Vertices: $(1, 1)$
 $(-7, 1)$
 Co-vertices: $(-3, 3)$
 $(-3, -1)$
 Foci: $(-3 + 2\sqrt{3}, 1)$
 $(-3 - 2\sqrt{3}, 1)$

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



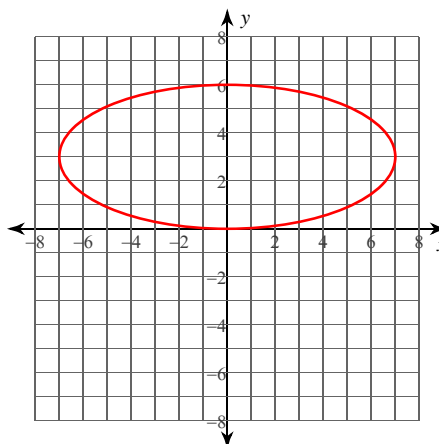
Center: $(3, 1)$
 Vertices: $(3, 1 + \sqrt{15})$
 $(3, 1 - \sqrt{15})$
 Co-vertices: $(3 + \sqrt{5}, 1)$
 $(3 - \sqrt{5}, 1)$
 Foci: $(3, 1 + \sqrt{10})$
 $(3, 1 - \sqrt{10})$

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



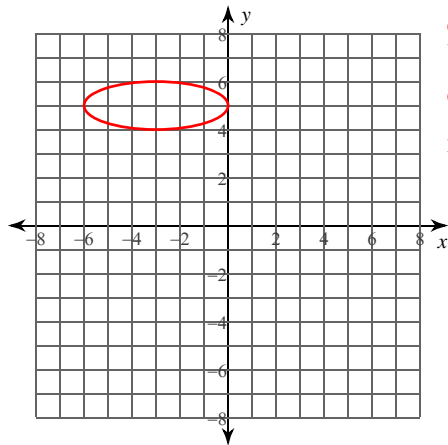
Center: $(1, -5)$
 Vertices: $(4, -5)$
 $(-2, -5)$
 Co-vertices: $(1, -3)$
 $(1, -7)$
 Foci: $(1 + \sqrt{5}, -5)$
 $(1 - \sqrt{5}, -5)$

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



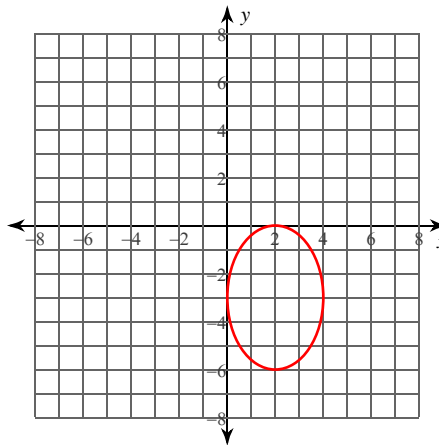
Center: $(0, 3)$
 Vertices: $(7, 3)$
 $(-7, 3)$
 Co-vertices: $(0, 6)$
 $(0, 0)$
 Foci: $(2\sqrt{10}, 3)$
 $(-2\sqrt{10}, 3)$

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: $(-8, 5)$

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