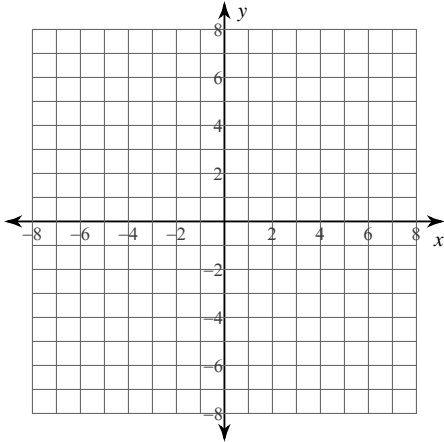


Conic Sections: Ellipses

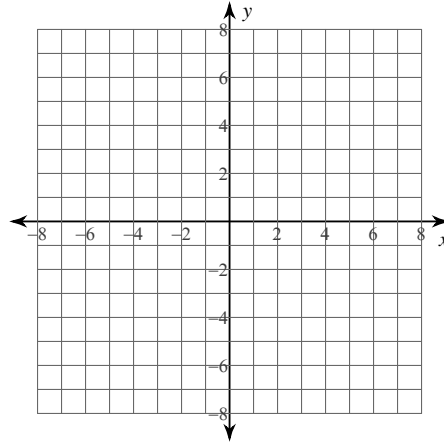
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Identify the center, vertices, co-vertices, foci, length of the major axis, length of the minor axis, length of the latus rectum, and eccentricity of each. Then sketch the graph.

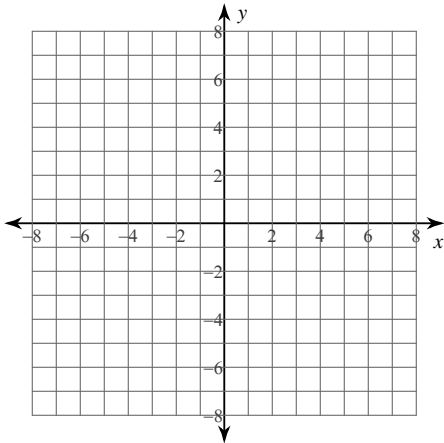
$$1) \frac{(x-2)^2}{9} + \frac{(y-3)^2}{16} = 1$$



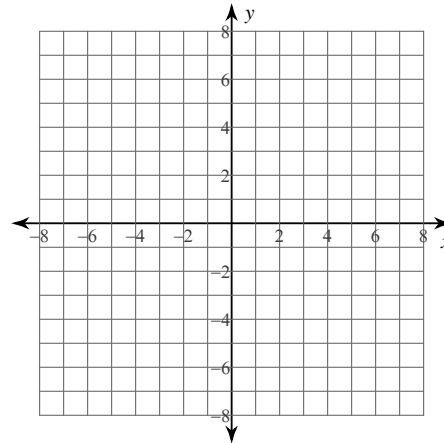
$$2) (x-1)^2 + \frac{(y-1)^2}{4} = 1$$



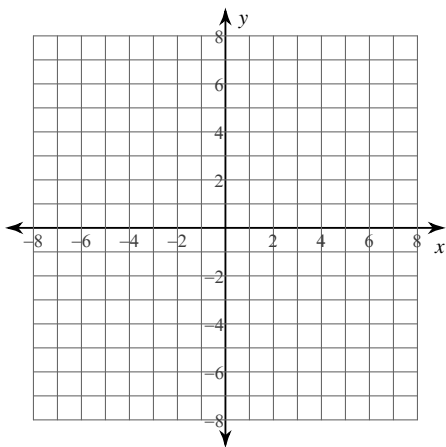
$$3) \frac{x^2}{25} + (y-4)^2 = 1$$



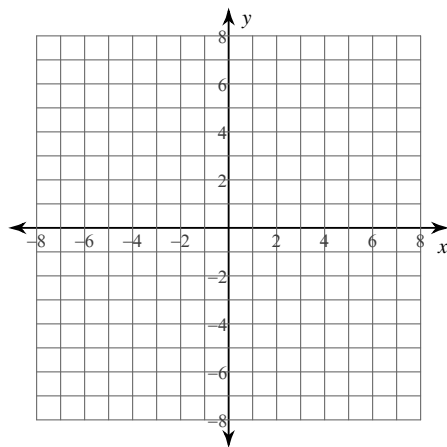
$$4) \frac{x^2}{49} + \frac{(y-1)^2}{16} = 1$$



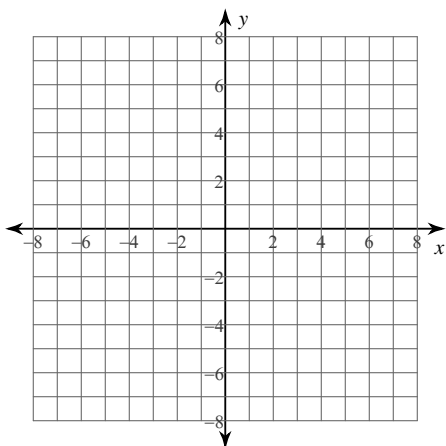
$$5) \frac{(x-1)^2}{16} + \frac{(y-1)^2}{4} = 1$$



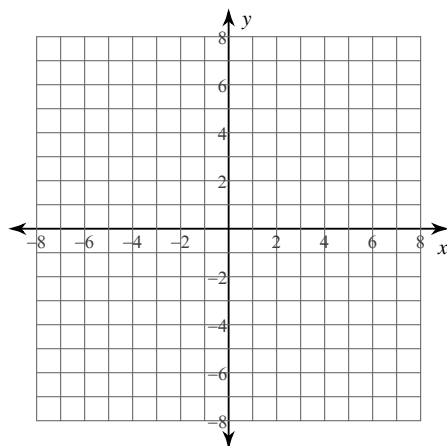
$$6) \frac{x^2}{36} + \frac{(y+1)^2}{25} = 1$$



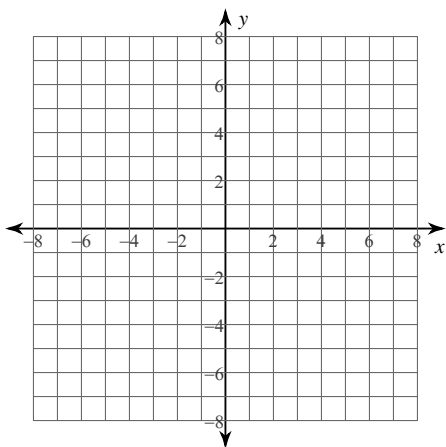
$$7) \frac{x^2}{36} + (y-3)^2 = 1$$



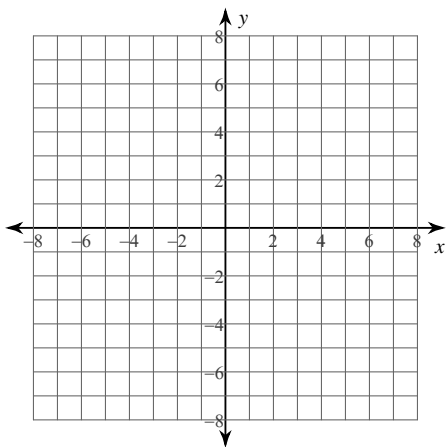
$$8) \frac{x^2}{49} + \frac{(y-1)^2}{25} = 1$$



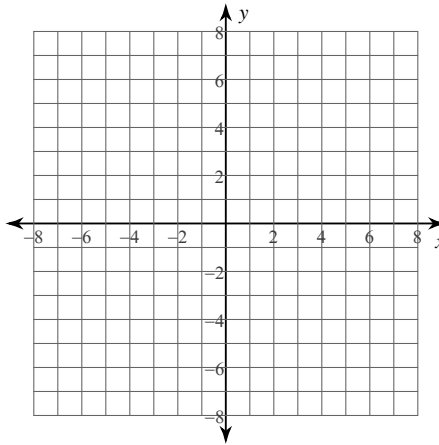
$$9) \frac{(x-1)^2}{35} + \frac{(y-2)^2}{25} = 1$$



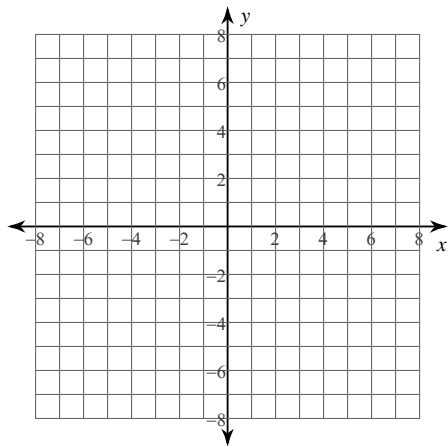
$$10) \frac{x^2}{25} + y^2 = 1$$



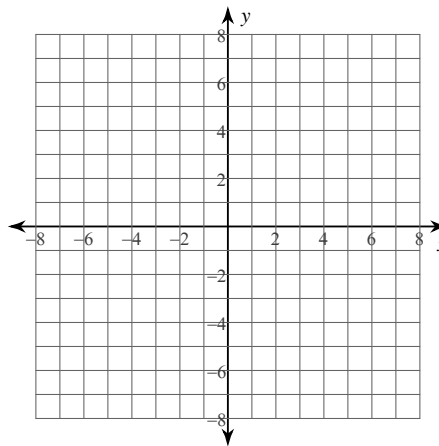
$$11) 16x^2 + 25y^2 + 32x + 150y - 159 = 0$$



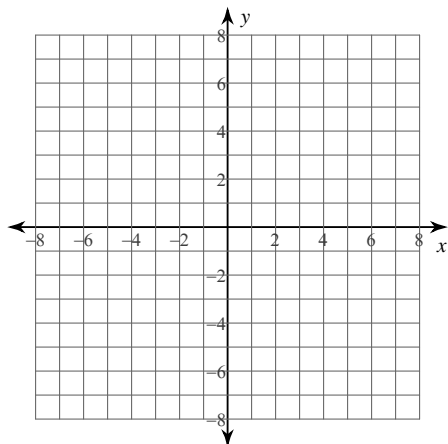
$$12) 4x^2 + 5y^2 + 16x + 10y - 79 = 0$$



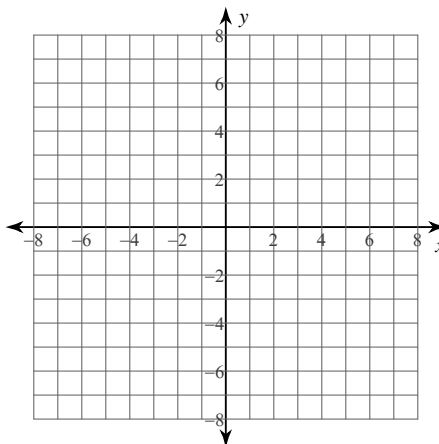
$$13) 4x^2 + 25y^2 + 200y + 300 = 0$$



$$14) 2x^2 + 3y^2 + 12x - 6y - 9 = 0$$

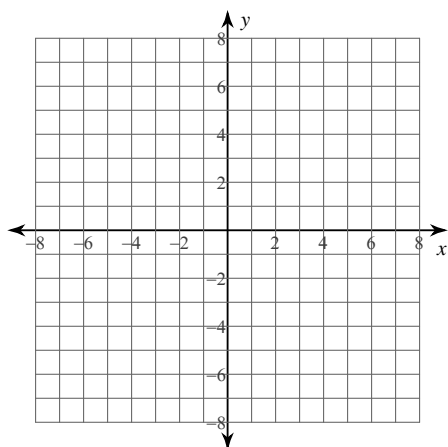


$$15) x^2 + 3y^2 - 6x + 6y - 3 = 0$$

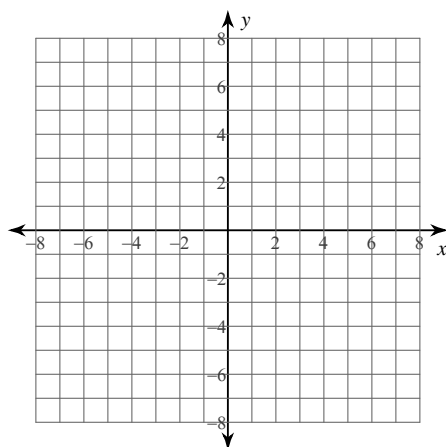


Identify the vertices and foci of each. Then sketch the graph.

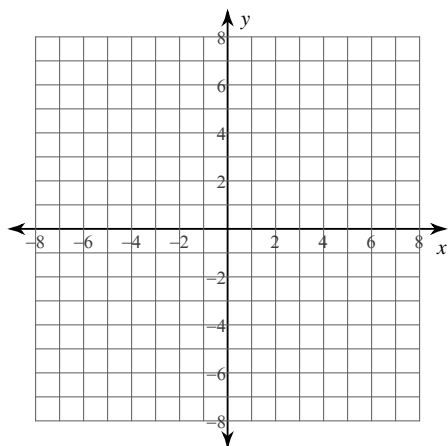
16) $4x^2 + 9y^2 + 32x - 72y + 172 = 0$



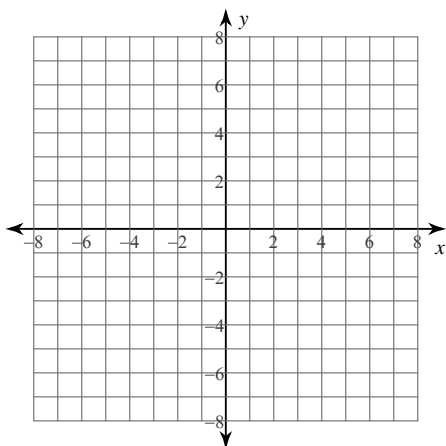
17) $x^2 + 9y^2 + 54y + 72 = 0$



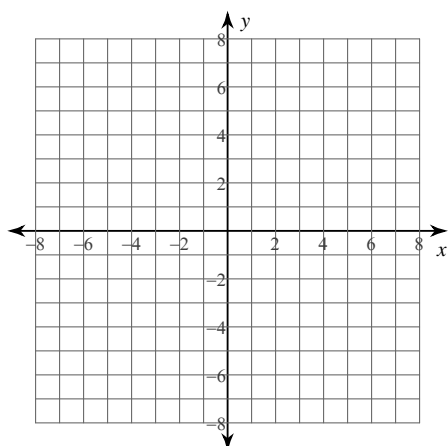
18) $25x^2 + 9y^2 + 50x - 18y - 191 = 0$



19) $25x^2 + 4y^2 - 200x - 16y + 316 = 0$

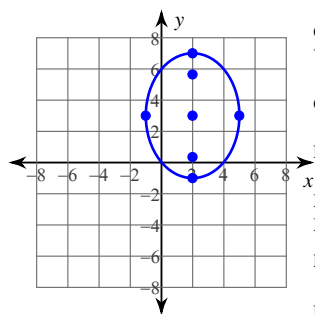


20) $x^2 + 4y^2 - 2x - 12y - 26 = 0$



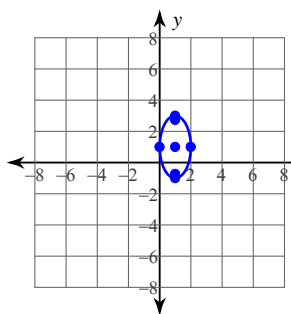
Answers to Conic Sections: Ellipses

1)



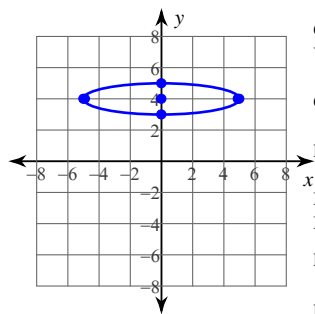
Center: $(2, 3)$
 Vertices: $(2, 7)$
 $(2, -1)$
 Co-vertices: $(5, 3)$
 $(-1, 3)$
 Foci: $(2, 3 + \sqrt{7})$
 $(2, 3 - \sqrt{7})$
 Major Axis: 8 units
 Minor Axis: 6 units
 Latus Rectum: $\frac{9}{2}$ units
 Eccentricity: $\frac{\sqrt{7}}{4} \approx 0.661$

2)



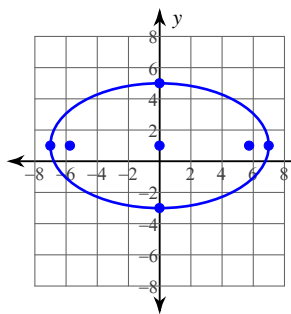
Center: $(1, 1)$
 Vertices: $(1, 3)$
 $(1, -1)$
 Co-vertices: $(2, 1)$
 $(0, 1)$
 Foci: $(1, 1 + \sqrt{3})$
 $(1, 1 - \sqrt{3})$
 Major Axis: 4 units
 Minor Axis: 2 units
 Latus Rectum: 1 unit
 Eccentricity: $\frac{\sqrt{3}}{2} \approx 0.866$

3)



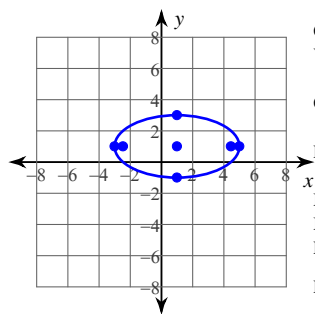
Center: $(0, 4)$
 Vertices: $(5, 4)$
 $(-5, 4)$
 Co-vertices: $(0, 5)$
 $(0, 3)$
 Foci: $(2\sqrt{6}, 4)$
 $(-2\sqrt{6}, 4)$
 Major Axis: 10 units
 Minor Axis: 2 units
 Latus Rectum: $\frac{2}{5}$ units
 Eccentricity: $\frac{2\sqrt{6}}{5} \approx 0.98$

4)



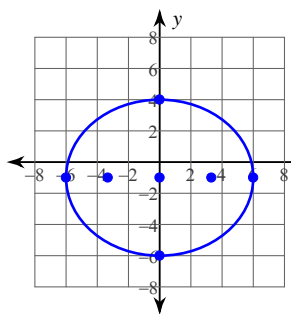
Center: $(0, 1)$
 Vertices: $(7, 1)$
 $(-7, 1)$
 Co-vertices: $(0, 5)$
 $(0, -3)$
 Foci: $(\sqrt{33}, 1)$
 $(-\sqrt{33}, 1)$
 Major Axis: 14 units
 Minor Axis: 8 units
 Latus Rectum: $\frac{32}{7}$ units
 Eccentricity: $\frac{\sqrt{33}}{7} \approx 0.821$

5)



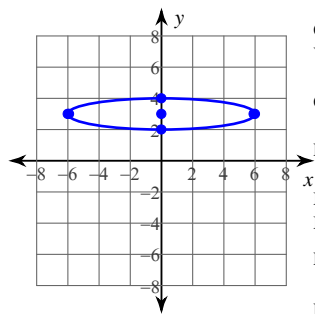
Center: $(1, 1)$
 Vertices: $(5, 1)$
 $(-3, 1)$
 Co-vertices: $(1, 3)$
 $(1, -1)$
 Foci: $(1 + 2\sqrt{3}, 1)$
 $(1 - 2\sqrt{3}, 1)$
 Major Axis: 8 units
 Minor Axis: 4 units
 Latus Rectum: 2 units
 Eccentricity: $\frac{\sqrt{3}}{2} \approx 0.866$

6)



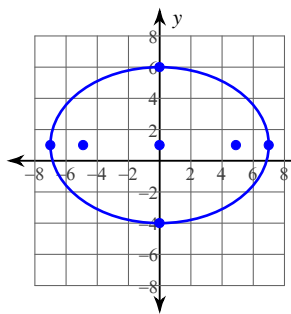
Center: $(0, -1)$
 Vertices: $(6, -1)$
 $(-6, -1)$
 Co-vertices: $(0, 4)$
 $(0, -6)$
 Foci: $(\sqrt{11}, -1)$
 $(-\sqrt{11}, -1)$
 Major Axis: 12 units
 Minor Axis: 10 units
 Latus Rectum: $\frac{25}{3}$ units
 Eccentricity: $\frac{\sqrt{11}}{6} \approx 0.553$

7)



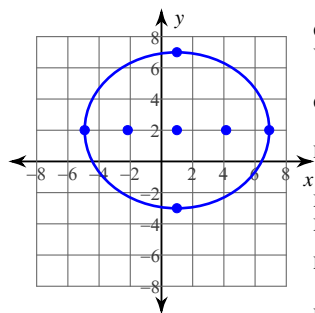
Center: $(0, 3)$
 Vertices: $(6, 3)$
 $(-6, 3)$
 Co-vertices: $(0, 4)$
 $(0, 2)$
 Foci: $(\sqrt{35}, 3)$
 $(-\sqrt{35}, 3)$
 Major Axis: 12 units
 Minor Axis: 2 units
 Latus Rectum: $\frac{1}{3}$ units
 Eccentricity: $\frac{\sqrt{35}}{6} \approx 0.986$

8)



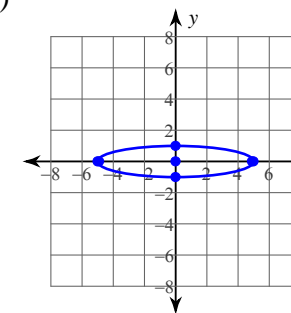
Center: $(0, 1)$
 Vertices: $(7, 1)$
 $(-7, 1)$
 Co-vertices: $(0, 6)$
 $(0, -4)$
 Foci: $(2\sqrt{6}, 1)$
 $(-2\sqrt{6}, 1)$
 Major Axis: 14 units
 Minor Axis: 10 units
 Latus Rectum: $\frac{50}{7}$ units
 Eccentricity: $\frac{2\sqrt{6}}{7} \approx 0.7$

9)



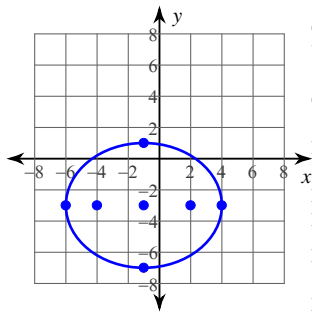
Center: $(1, 2)$
 Vertices: $(1 + \sqrt{35}, 2)$
 $(1 - \sqrt{35}, 2)$
 Co-vertices: $(1, 7)$
 $(1, -3)$
 Foci: $(1 + \sqrt{10}, 2)$
 $(1 - \sqrt{10}, 2)$
 Major Axis: $2\sqrt{35}$ units
 Minor Axis: 10 units
 Latus Rectum: $\frac{10\sqrt{35}}{7}$ units
 Eccentricity: $\frac{\sqrt{14}}{7} \approx 0.535$

10)



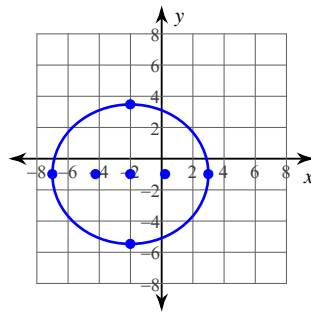
Center: $(0, 0)$
 Vertices: $(5, 0)$
 $(-5, 0)$
 Co-vertices: $(0, 1)$
 $(0, -1)$
 Foci: $(2\sqrt{6}, 0)$
 $(-2\sqrt{6}, 0)$
 Major Axis: 10 units
 Minor Axis: 2 units
 Latus Rectum: $\frac{2}{5}$ units
 Eccentricity: $\frac{2\sqrt{6}}{5} \approx 0.98$

11)



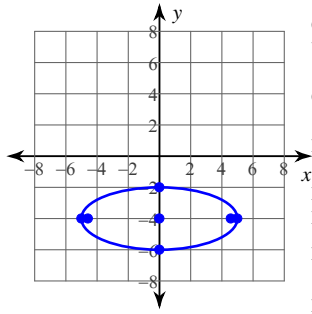
Center: $(-1, -3)$
 Vertices: $(4, -3)$
 $(-6, -3)$
 Co-vertices: $(-1, 1)$
 $(-1, -7)$
 Foci: $(2, -3)$
 $(-4, -3)$
 Major Axis: 10 units
 Minor Axis: 8 units
 Latus Rectum: $\frac{32}{5}$ units
 Eccentricity: $\frac{3}{5} = 0.6$

12)



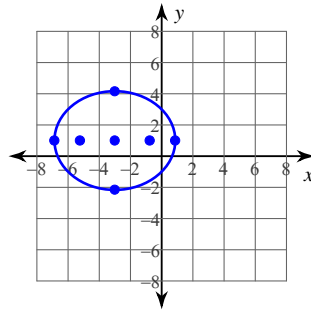
Center: $(-2, -1)$
 Vertices: $(3, -1)$
 $(-7, -1)$
 Co-vertices: $(-2, -1 + 2\sqrt{5})$
 $(-2, -1 - 2\sqrt{5})$
 Foci: $(-2 + \sqrt{5}, -1)$
 $(-2 - \sqrt{5}, -1)$
 Major Axis: 10 units
 Minor Axis: $4\sqrt{5}$ units
 Latus Rectum: 8 units
 Eccentricity: $\frac{\sqrt{5}}{5} \approx 0.447$

13)



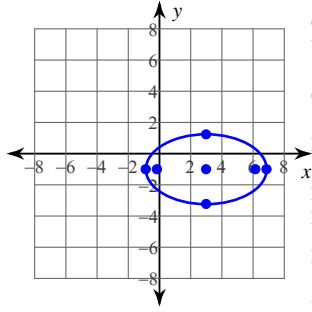
Center: $(0, -4)$
 Vertices: $(5, -4)$
 $(-5, -4)$
 Co-vertices: $(0, -2)$
 $(0, -6)$
 Foci: $(\sqrt{21}, -4)$
 $(-\sqrt{21}, -4)$
 Major Axis: 10 units
 Minor Axis: 4 units
 Latus Rectum: $\frac{8}{5}$ units
 Eccentricity: $\frac{\sqrt{21}}{5} \approx 0.917$

14)



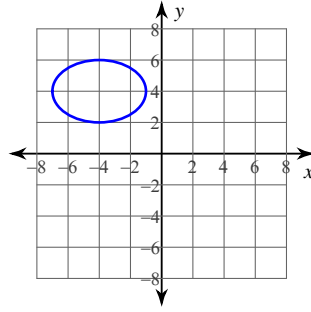
Center: $(-3, 1)$
 Vertices: $(-3 + \sqrt{15}, 1)$
 $(-3 - \sqrt{15}, 1)$
 Co-vertices: $(-3, 1 + \sqrt{10})$
 $(-3, 1 - \sqrt{10})$
 Foci: $(-3 + \sqrt{5}, 1)$
 $(-3 - \sqrt{5}, 1)$
 Major Axis: $2\sqrt{15}$ units
 Minor Axis: $2\sqrt{10}$ units
 Latus Rectum: $\frac{4\sqrt{15}}{3}$ units
 Eccentricity: $\frac{\sqrt{3}}{3} \approx 0.577$

15)



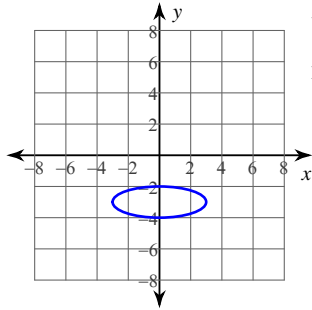
Center: $(3, -1)$
 Vertices: $(3 + \sqrt{15}, -1)$
 $(3 - \sqrt{15}, -1)$
 Co-vertices: $(3, -1 + \sqrt{5})$
 $(3, -1 - \sqrt{5})$
 Foci: $(3 + \sqrt{10}, -1)$
 $(3 - \sqrt{10}, -1)$
 Major Axis: $2\sqrt{15}$ units
 Minor Axis: $2\sqrt{5}$ units
 Latus Rectum: $\frac{2\sqrt{15}}{3}$ units
 Eccentricity: $\frac{\sqrt{6}}{3} \approx 0.816$

16)



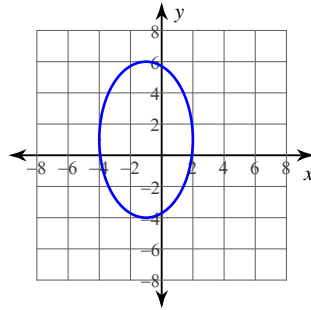
Vertices: $(-1, 4)$
 $(-7, 4)$
 Foci: $(-4 + \sqrt{5}, 4)$
 $(-4 - \sqrt{5}, 4)$

17)



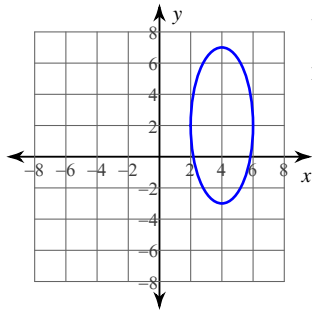
Vertices: $(3, -3)$
 $(-3, -3)$
 Foci: $(2\sqrt{2}, -3)$
 $(-2\sqrt{2}, -3)$

18)



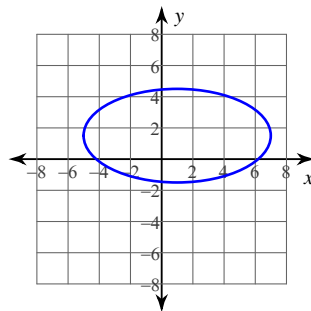
Vertices: $(-1, 6)$
 $(-1, -4)$
 Foci: $(-1, 5)$
 $(-1, -3)$

19)



Vertices: $(4, 7)$
 $(4, -3)$
 Foci: $(4, 2 + \sqrt{21})$
 $(4, 2 - \sqrt{21})$

20)



Vertices: $(7, \frac{3}{2})$
 $(-5, \frac{3}{2})$
 Foci: $(1 + 3\sqrt{3}, \frac{3}{2})$
 $(1 - 3\sqrt{3}, \frac{3}{2})$