Warm-up

Find an equation in standard form for the following:

$(x+2)^2+(y-4)^2=81$

$(x+1)^2=-12(y-6)$

$(y+3)^2=-6(x-3.5)$

1) Circle: center (-2, 4), radius 9

2) Parabola: focus (-1, 3), vertex (-1, 6)

3) Parabola: focus (2, -3), directrix (x = 5)

$(-4,-1)$ $\quad$ $(y=-1/2)$ $\quad$ $(-4,-1.5)$

Find the vertex, directrix and focus:

$(-3,0)$ $\quad$ $x=-4$ $\quad$ $(-2,0)$

4) $(x+4)^2 = -2\,(y+1)$

5) $5y^2 = 20\,(x+3)$

Homework Section 8.1

In Exercises 11–30, find an equation in standard form for the parabola that satisfies the given conditions.

11. Vertex (0, 0), focus (−3, 0) $y^2 = -12x$

14. Vertex (0, 0), directrix $x = -2$ $y^2 = 8x$

17. Vertex (0, 0), opens to the right, focal width = 8 $y^2 = 8x$

20. Vertex (0, 0), opens upward, focal width = 3 $x^2 = 3y$

23. Focus (3, 4), directrix $y = 1$ $(x-3)^2 = 6(y-5/2)$

26. Vertex (3, 5), directrix $y = 7$ $(x-3)^2 = -8(y-5)$

30. Vertex (2, 3), opens to the right, focal width = 5

30. $(y-3)^2 = 5(x-2)$

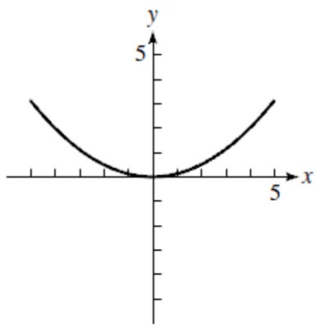
In Exercises 31–36, sketch the graph of the parabola by hand.

32. $x^2 = 8y$

34. $(y + 2)^2 = -16(x + 3)$

36. $(x - 5)^2 = 20(y + 2)$

32.



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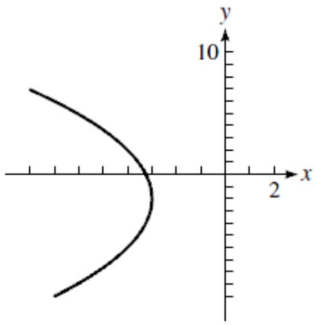

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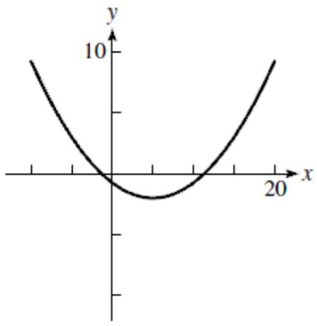


In Exercises 49–52, prove that the graph of the equation is a parabola, and find its vertex, focus, and directrix.

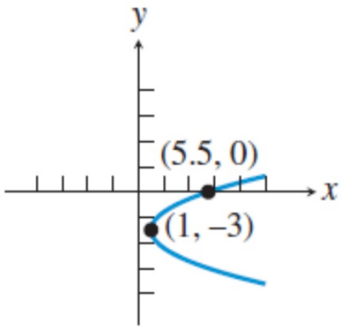
50. $3x^2 - 6x - 6y + 10 = 0$

52. $y^2 - 2y + 4x - 12 = 0$

50. Completing the square, the equation becomes $(x - 1)^2 = 2(y - 7/6)$, a parabola with vertex $(1, 7/6)$, focus $(1, 5/3)$ and directrix $y = 2/3$.

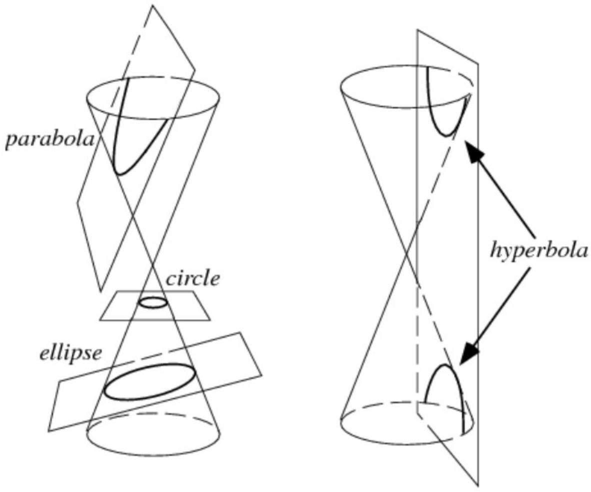
52. Completing the square, the equation becomes $(y - 1)^2 = -4(x - 13/4)$, vertex $(13/4, 1)$, focus $(9/4, 1)$, and directrix $x = 17/4$.

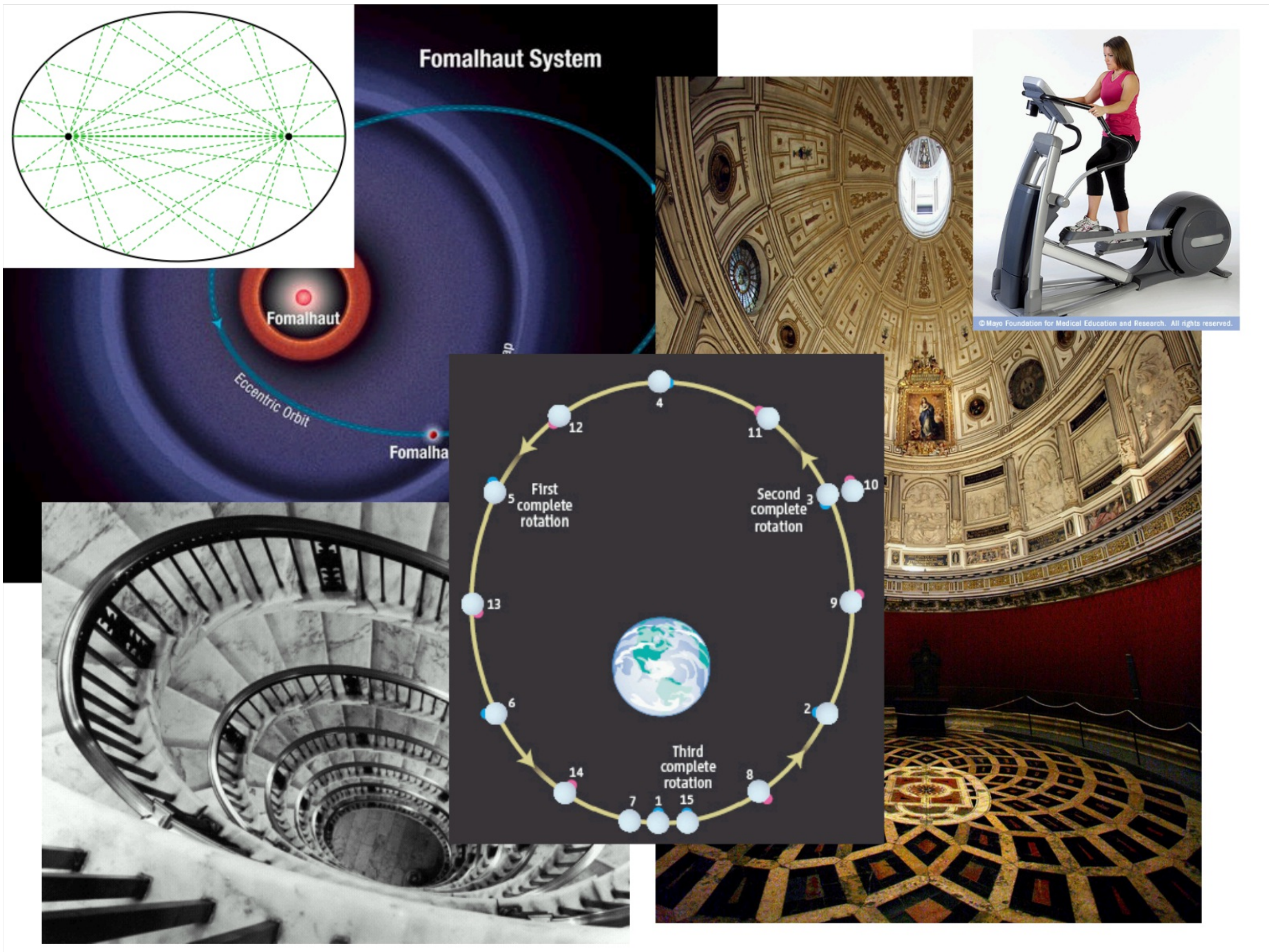
54.



$(y + 3)^2 = 2(x - 1)$

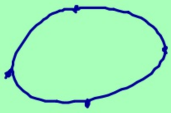
Diagramming an ELLIPSE!!





8-2 Objective: Graph and write an equation for an ellipse.

An ellipse is the set of all points in a plane such that the sum of the distances from two fixed points (foci) is constant.



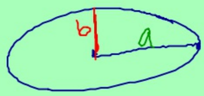
Major Axis: longest axis **(Vertices)**

Minor Axis: shortest axis **(Co-Vertices)**

The two axes intersect at the center of the ellipse.

What is the standard form of a vertical ellipse? $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$

What is the standard form of a horizontal ellipse? $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$



How do you determine "a" and "b?" $a > b$

Center (h, k)

Length of major axis $2a$

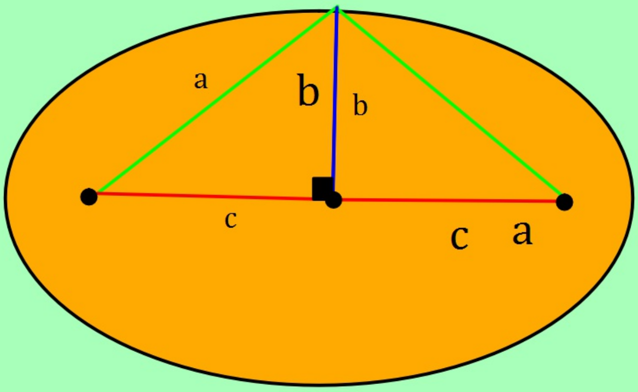
Length of minor axis $2b$

Eccentricity: $\frac{c}{a}$ $0 < e < 1$

CIRCULAR FLATTER

How to find the Foci??

$c^2 = a^2 - b^2$



3. Find each of the following ellipse: $\frac{x^2}{5} + \frac{y^2}{9} = 1$

b^2 a^2

Length of the major axis: 6

Length of the minor axis: $2\sqrt{5}$

Foci: $(0, \pm 2)$

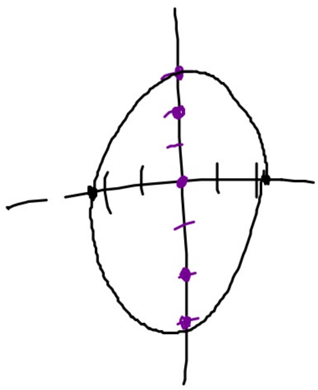
Center: $(0,0)$

$c^2 = a^2 - b^2$

$c^2 = 9 - 5$

$c^2 = 4$

$c = 2$



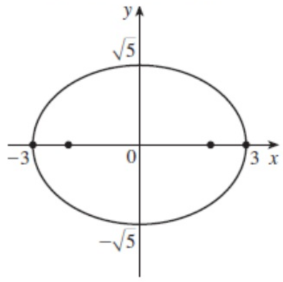
11–16 ■ Find the vertices and foci of the ellipse and sketch its graph.

11. $\frac{x^2}{9} + \frac{y^2}{5} = 1$ **12.** $\frac{x^2}{64} + \frac{y^2}{100} = 1$

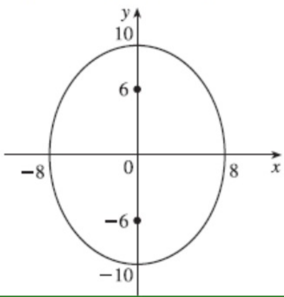
13. $4x^2 + y^2 = 16$

$\frac{4x^2}{16} + \frac{y^2}{16} = \frac{16}{16}$

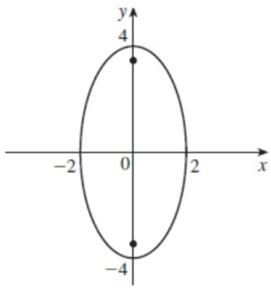
11. $(\pm 3, 0), (\pm 2, 0)$



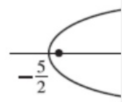
12. $(0, \pm 10), (0, \pm 6)$



13. $(0, \pm 4), (0, \pm 2\sqrt{3})$



14. $(\pm\frac{5}{2}, 0)$



In Exercises 37–40, find the center, vertices, and foci of the ellipse.

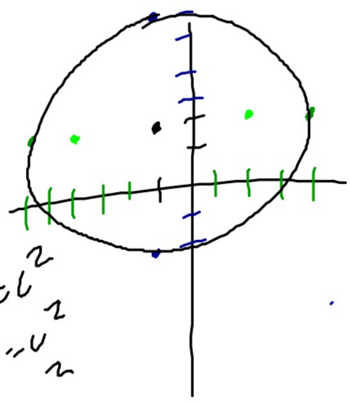
37. $\frac{(x+1)^2}{25} + \frac{(y-2)^2}{16} = 1$

Length of the major axis: 10

Length of the minor axis: 8 $\frac{3}{5}$

Foci: $(-4, 2)$ $(2, 2)$

Center: $(-1, 2)$



$a^2 - b^2 = c^2$

$25 - 16 = c^2$

$9 = c^2$

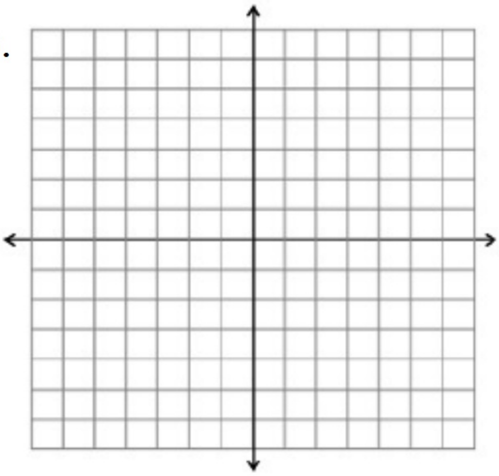
$3 = c$

Sketch the ellipses by hand and give the foci

13. $\frac{y^2}{9} + \frac{x^2}{4} = 1$

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

13.



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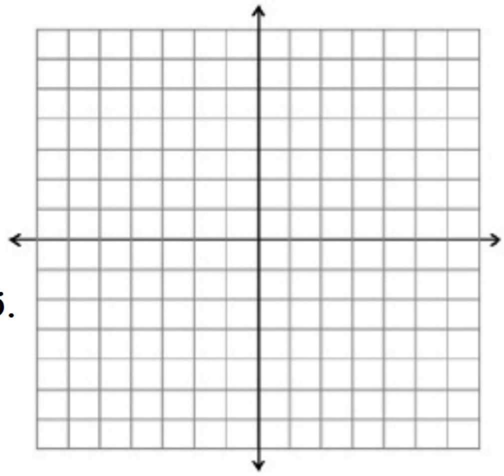
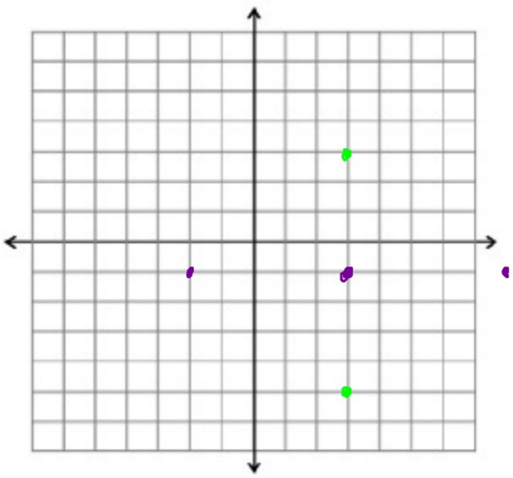


Finding an Equation of an Ellipse

Find the standard form of the equation for the ellipse whose major axis has endpoints $(-2, -1)$ and $(8, -1)$, and whose minor axis has length 8. 2



$c: (3, -1)$

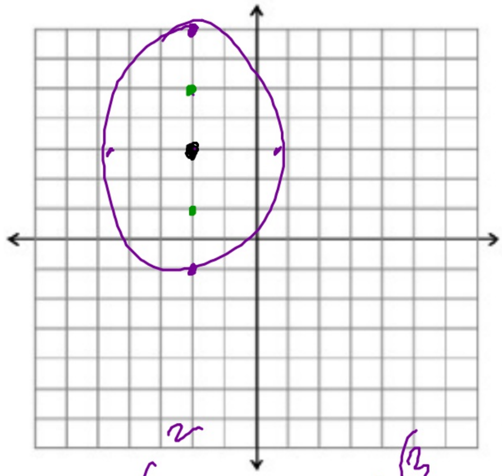
$$\frac{(x-3)^2}{25} + \frac{(y+1)^2}{16} = 1$$

6. Write the equation of the ellipse:

The foci are (−2, 1) and (−2, 5); the major axis endpoints are (−2, −1) and (−2, 7).

$-2, 3$

$$\frac{(x+2)^2}{12} + \frac{(y-3)^2}{16} = 1$$



$a^2 - b^2 = c^2$

$16 - b^2 = 4$

$b^2 = 12$

$b = 2\sqrt{3}$

31–48 ■ Find an equation for the conic that satisfies the given conditions.

37. Ellipse, foci $(\pm 2, 0)$, vertices $(\pm 5, 0)$

38. Ellipse, foci $(0, \pm 5)$, vertices $(0, \pm 13)$

39. Ellipse, foci $(0, 2), (0, 6)$ vertices $(0, 0), (0, 8)$

40. Ellipse, foci $(0, -1), (8, -1)$, vertex $(9, -1)$

41. Ellipse, center $(2, 2)$, focus $(0, 2)$, vertex $(5, 2)$

36. $2x^2 + 4x - y + 3 = 0$

37. $\frac{x^2}{25} + \frac{y^2}{21} = 1$

38. $\frac{x^2}{144} + \frac{y^2}{169} = 1$

39. $\frac{x^2}{12} + \frac{(y-4)^2}{16} = 1$

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

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

In Exercises 37–40, find the center, vertices, and foci of the ellipse.

37. $\frac{(x+1)^2}{25} + \frac{(y-2)^2}{16} = 1$

Try this one! prove that the graph of the equation is an ellipse, and find its vertices, foci, and eccentricity.

$9x^2 + 4y^2 - 18x + 8y - 23 = 0$

$9x^2 - 18x \quad + 4y^2 + 8y \quad = 23$

$9(x^2 - 2x + 1) + 4(y^2 + 2y + 1) = 23 + 9 + 4$

$\frac{9(x-1)^2}{36} + \frac{4(y+1)^2}{36} = \frac{36}{36}$ $\quad \frac{(x-1)^2}{4} + \frac{(y+1)^2}{9} = 1$

9. Find the coordinates of the center and foci and the lengths of the major and minor axis of the ellipse with equation

~~**15.** $9x^2 - 18x + 4y^2 = 27$~~

16. $x^2 + 2y^2 - 6x + 4y + 7 = 0$

$-7 \quad +9+2$

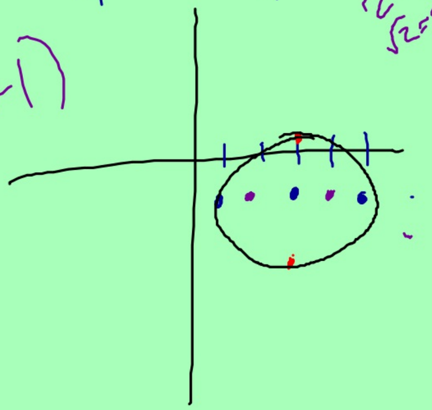
$$\frac{(x-3)^2}{4} + \frac{2(y+1)^2}{4} = \frac{4}{4}$$

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

$2 = c^2$

$\sqrt{2} = c$

$(3 \pm \sqrt{2}, -1)$



12. $\frac{\quad}{81} + \frac{\quad}{25} = 1$

In Exercises 11–16, sketch the graph of the ellipse by hand.

14. $\frac{y^2}{49} + \frac{x^2}{25} = 1$

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

In Exercises 21–36, find an equation in standard form for the ellipse that satisfies the given conditions.

21. Major axis length 6 on y-axis, minor axis length 4

24. Foci $(0, \pm 3)$, major axis length 10

27. Major axis endpoints $(0, \pm 6)$, minor axis length 8

30. Minor axis endpoints $(\pm 12, 0)$, major axis length 26

33. The foci are $(1, -4)$ and $(5, -4)$; the major axis endpoints are $(0, -4)$ and $(6, -4)$.

36. The major axis endpoints are $(-5, 2)$ and $(3, 2)$; the minor axis length is 6.

In Exercises 37–40, find the center, vertices, and foci of the ellipse.

38. $\frac{(x-3)^2}{11} + \frac{(y-5)^2}{7} = 1$

40. $\frac{(y-1)^2}{25} + \frac{(x+2)^2}{16} = 1$

In Exercises 45–48, prove that the graph of the equation is an ellipse, and find its vertices, foci, and eccentricity.

46. $3x^2 + 5y^2 - 12x + 30y + 42 = 0$

48. $4x^2 + y^2 - 32x + 16y + 124 = 0$

In Exercises 49 and 50, write an equation for the ellipse.

50.