

# CHAPTER 8 REVIEW EXERCISES

## Section 8.1

Find the center, foci, and vertices of the ellipse that each equation describes.

1.  $(x-3)^2 + 4(y+1)^2 = 16$

2.  $9x^2 + 4y^2 + 18x - 16y + 9 = 0$

Sketch the graphs of the following ellipses and determine the coordinates of the foci.

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

4.  $x^2 + 9y^2 - 6x + 18y = -9$

5.  $3x^2 + y^2 = 27$

6.  $25x^2 + 4y^2 - 200x + 300 = 0$

In each of the following exercises, an ellipse is described by either a picture or by the properties it possesses. Find the equation, in standard form, for each ellipse.

7. Center at  $(-1, 4)$ , major axis is vertical and of length 8, foci  $\sqrt{7}$  units from the center.

8. Foci at  $(1, 2)$  and  $(7, 2)$ ,  $e = \frac{1}{2}$ .

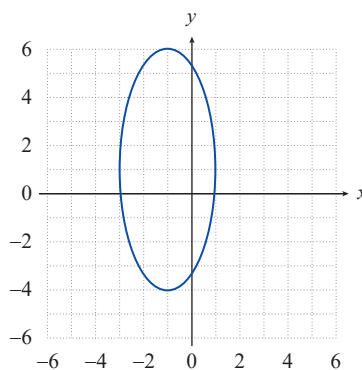
9. Vertices at  $(\frac{7}{2}, -1)$  and  $(\frac{1}{2}, -1)$ ,  $e = 0$ .

10. Vertices at  $(1, -8)$  and  $(1, 2)$ , minor axis of length 6.

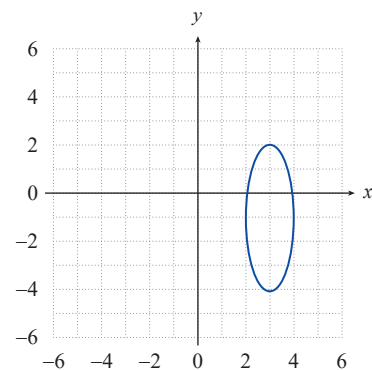
11. Foci at  $(0, 0)$  and  $(4, 0)$ , major axis of length 8.

12. Center at  $(0, 4)$ ,  $a = 2c$ , and vertices at  $(-4, 4)$  and  $(4, 4)$ .

13.



14.



For exercises 15 and 16, use the fact that the area  $A$  of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  is  $A = \pi \cdot a \cdot b$  and  $a + b = 30$ .

15. Write the area of the ellipse as a function of  $a$ .

16. Find the equation of an ellipse with an area of  $200\pi$  square inches.

## Section 8.2

Graph the following parabolas and determine the focus and directrix of each.

17.  $(y+1)^2 = -12(x+3)$

18.  $y^2 - 8y + 2x + 14 = 0$

19.  $y^2 + 2y = 4x - 1$

20.  $x + \frac{1}{4}y^2 = 0$

21.  $2y + 4x^2 = 8$

22.  $y^2 - 4y + 2x + 24 = 0$

Find the equation, in standard form, for the parabola with the given properties or with the given graph.

23. Vertex at  $(-2, 3)$ , directrix is the line  $y = 2$ .

24. Vertex at  $(5, -3)$ , focus at  $(5, 1)$ .

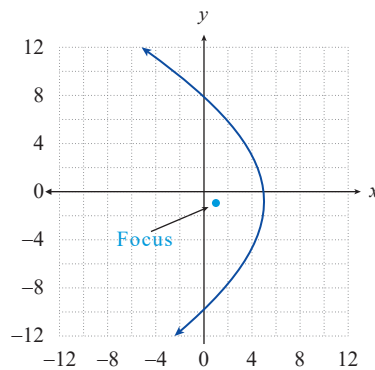
25. Focus at  $(3, -1)$ , directrix is the line  $x = 2$ .

26. Focus at  $(1, -2)$ , directrix is the  $x$ -axis.

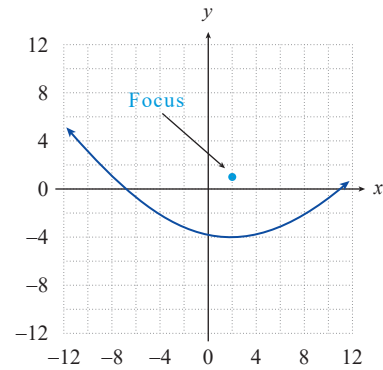
27. Vertex at  $(2, -1)$ , directrix is the line  $x = -2$ .

28. Symmetric with respect to the  $x$ -axis, focus at  $(-3, 0)$ , and  $p = 4$ .

29.



30.



31. A motorcycle headlight is made by placing a strong light bulb inside a reflective paraboloid formed by rotating the parabola  $x^2 = 5y$  around its axis of symmetry (assume that  $x$  and  $y$  are in units of inches). In order to have the brightest, most concentrated light beam, how far from the vertex should the bulb be placed?

## Section 8.3

Sketch the graphs of the following hyperbolas, using asymptotes as guides. Determine the coordinates of the foci in each case.

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

33.  $9x^2 - 4y^2 + 54x - 8y + 41 = 0$

34.  $x^2 - y^2 = 1$

35.  $\frac{y^2}{25} - \frac{x^2}{144} = 1$

Find the center, foci, and vertices of the hyperbola that each equation describes.

36.  $(x+1)^2 - 4(y-2)^2 = 36$

37.  $x^2 - 9y^2 + 36y - 72 = 0$

38.  $y^2 - 4x^2 - 2y - 32x = 67$

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

Find the equation, in standard form, for the hyperbola with the given properties or with the given graph.

40. Vertices at  $(4, -1)$  and  $(-2, -1)$  and foci at  $(5, -1)$  and  $(-3, -1)$ .

41. Asymptotes of  $y = \pm \frac{5}{2}(x+1) - 2$  and vertices at  $(-3, -2)$  and  $(1, -2)$ .

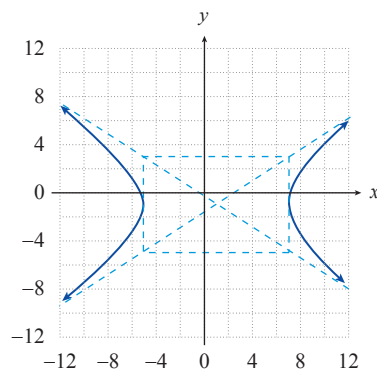
42. Foci at  $(-1, -2)$  and  $(-1, 8)$  and asymptotes of  $y = \pm \left(\frac{3}{4}x + \frac{3}{4}\right) + 3$ .

43. Asymptotes of  $y = \pm(3x - 6) + 2$  and vertices at  $(2, -1)$  and  $(2, 5)$ .

44. Vertices at  $(\pm 3, 0)$  and foci at  $(\pm 5, 0)$ .

45. Foci at  $(-1, 7 \pm \sqrt{13})$  and asymptotes of  $y = \pm \frac{2}{3}(x+1) + 7$ .

46.



47.

