3.6 EXERCISES

In Exercises 1–12, the equation of a conic section is given in a familiar form. Identify the type of graph that the equation has, without actually graphing.

1. $x^2 + y^2 = 144$

2. $(x - 2)^2 + (y + 3)^2 = 25$

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

4. $x = 3y^2 + 5y - 6$

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

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

7. $\frac{x^2}{49} + \frac{y^2}{100} = 1$

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

9. $\frac{x^2}{4} - \frac{y^2}{16} = 1$

10. $\frac{(x + 2)^2}{9} + \frac{(y - 4)^2}{16} = 1$

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

12. $y = 4(x + 3)^2 - 7$

For each of the following equations that has a graph, identify the corresponding graph. It may be necessary to transform the equation. See Examples 1 and 2.

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

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

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

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

17. $x^2 + 2x = x^2 + y - 6$

18. $y^2 - 4y = y^2 + 3 - x$

19. $x^2 = 25 + y^2$

20. $x^2 = 25 - y^2$

21. $9x^2 + 36y^2 = 36$

22. $x^2 = 4y - 8$

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

24. $\frac{(x - 4)^2}{8} + \frac{(y + 1)^2}{2} = 0$

25. $y^2 - 4y = x + 4$

26. $11 - 3x = 2y^2 - 8y$

27. $(x + 7)^2 + (y - 5)^2 + 4 = 0$

28. $4(x - 3)^2 + 3(y + 4)^2 = 0$

29. $3x^2 + 6x + 3y^2 - 12y = 12$

30. $2x^2 - 8x + 2y^2 + 20y = 12$

31. $x^2 - 6x + y = 0$

32. $x - 4y^2 - 8y = 0$

33. $4x^2 - 8x - y^2 - 6y = 6$

34. $x^2 + 2x = x^2 - 4y - 2$

35. $4x^2 - 8x + 9y^2 + 54y = -84$

36. $3x^2 + 12x + 3y^2 = -11$

37. $6x^2 - 12x + 6y^2 - 18y + 25 = 0$

38. $4x^2 - 24x + 5y^2 + 10y + 41 = 0$

39. Identify the type of conic section consisting of the set of all points in the plane for which the sum of the distances from the points $(5, 0)$ and $(-5, 0)$ is 14.

40. Identify the type of conic section consisting of the set of all points in the plane for which the absolute value of the difference of the distances from the points $(3, 0)$ and $(-3, 0)$ is 2.

41. **(a)** Show by a sketch how a cone can be cut by a plane in exactly one point. (For this reason, a point is sometimes called a *degenerate circle* or *degenerate ellipse.*)
(b) Show by a sketch how a cone can be cut by a plane to produce exactly one straight line. (For this reason, a straight line is sometimes called a *degenerate parabola.*)

42. Following the definitions in Exercise 41, what is a *degenerate hyperbola*?

Graph each of the following, and give the domain and range. See Example 3.

43. $y = \sqrt{4 - x}$

44. $y = \sqrt{16 - x}$

45. $y = \sqrt{x^2 - 9}$

46. $y = -\sqrt{16 - x^2}$

47. $\frac{y}{3} = -\sqrt{1 + \frac{x^2}{16}}$

48. $\frac{y}{2} = \sqrt{1 - \frac{x^2}{25}}$

49. $y = \sqrt{1 - \frac{x^2}{64}}$

50. $y = \sqrt{1 + \frac{x^2}{36}}$

51. If you are given the graph of the relation $y = \sqrt{1 - x^2}$, how would you describe a procedure you can use to graph $y = -\sqrt{1 - x^2}$?