9.4 EXERCISES

PRACTICE

1. Given the parametric equations $x = 5 + t$ and $y = \dfrac{\sqrt{t}}{(t-2)}$, construct a table of the points (x, y) that result from integer t-values from 0 to 6, and then sketch the curve.

2. Given the parametric equations $x = \dfrac{\tan\theta}{2}$ and $y = \cos^2\theta + 3$, construct a table of the points (x, y) that result from the values $\theta = 0, \dfrac{\pi}{6}, \dfrac{\pi}{3}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{5\pi}{6}$, and π. Using these points, sketch the graph of the equations.

Sketch the graphs of the following parametric equations by eliminating the parameter. See Examples 3 and 4.

3. $x = 3(t+1)$ and $y = 2t$

4. $x = \sqrt{t-2}$ and $y = 3t - 2$

5. $x = 1 + t$ and $y = \dfrac{t-3}{2}$

6. $x = |t+3|$ and $y = t - 5$

7. $x = \dfrac{t}{4}$ and $y = t^2$

8. $x = \dfrac{t}{t+2}$ and $y = \sqrt{t}$

9. $x = \sqrt{t+3}$ and $y = t + 3$

10. $x = \dfrac{2}{|t-3|}$ and $y = 2t - 1$

11. $x = \cos\theta$ and $y = 2\sin\theta$

12. $x = 3\sin\theta - 1$ and $y = \dfrac{\cos\theta}{2}$

13. $x = 1 - \sin\theta$ and $y = \sin\theta - 1$

14. $x = 2\cos\theta$ and $y = 3\cos\theta$

15. $x = 2\sin\theta + 2$ and $y = 2\cos\theta + 2$

16. $x = \sin\theta$ and $y = 4 - 3\cos\theta$

Construct parametric equations describing the graphs of the following equations. See Example 5.

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

18. $y = 5x - 2$

19. $y = -x^2 - 5$

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

21. $x = y^2 + 4$

22. $y = x^2 + 1$

23. $y = \dfrac{1}{x}$

24. $x = 4y - 6$

25. $y = |x - 1|$

26. $x = 2(y-3)$

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

28. $x = \dfrac{1}{3y}$

29. $y = x^2 - x - 6$

Construct parametric equations for the line with the given attributes. (Answers will vary.)

30. Slope -2, passing through $(-5, -2)$

31. Slope $\dfrac{1}{4}$, passing through $(10, 12)$

32. Slope 3, passing through $(7, 2)$

33. Passing through $(0, 0)$ and $(7, 4)$

34. Passing through $(6, -3)$ and $(2, 3)$

35. Passing through $(12, 3)$ and $(-4, -5)$

Using the given values for x, construct parametric equations describing the graph of each of the following equations.

36. $y = 3x + 1$, given that $x = 2 + t$

37. $y = 2 - |x|$, given that $x = t - 5$

38. $y = 5 - x^2$, given that $x = t + 1$

39. $5 = 2y + x$, given that $x = 4t$

40. $\frac{x^2}{2} + 6 = y$, given that $x = t - 4$

41. $(x-2)^2 = y$, given that $x = 5t + 1$

Construct parametric equations for the circle with x the given attributes. (Answers will vary.)

42. Center $(0,0)$, radius 1

43. Center $(-4,2)$, radius 3

44. Center $(7,-5)$, radius 4

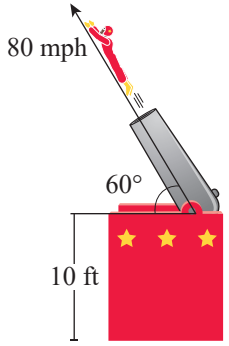
45. Center $(0,-2)$, radius 6

APPLICATIONS

46. François shoots a basketball at an angle of 48° from the horizontal. It leaves his hands 7 ft from the ground with a velocity of 21 ft/s.

a. Construct parametric equations representing the path of the ball.
b. Sketch a graph of the basketball's flight.
c. If the basket is 15 ft away and 11 ft high, will he make the shot?

47. Suppose that a circus performer is shot from a cannon at a rate of 80 mph, at an angle of 60° from the horizontal. The cannon sits on a platform 10 feet above the ground.



a. Construct parametric equations representing the performer's path as he flies through the air.
b. Sketch a graph of his flight.
c. How high is the acrobat 1.5 seconds after leaving the cannon?
d. How far from the cannon should a landing net be placed, if it is placed at ground level?
e. At what time t will the performer land in the net?
f. If a 12-foot-high wall of flames is placed 70 feet from the cannon, will he clear it unharmed?

48. On his morning paper route, John throws a newspaper from his car window 3.5 ft from the ground. The paper has an initial velocity of $10\ \text{ft/s}$ and is tossed at an angle of 10° from the horizontal.

a. Construct parametric equations modeling the path of the newspaper.
b. Sketch a graph of the paper's path.

49. A wheel of radius 12 inches rolls along a flat surface in a straight line. There is a fixed point P that initially lies at the point $(0,0)$. Find parametric equations defining the cycloid traced out by P.

50. A ball is rolled on the floor in a straight line from one person to another person. The ball has a radius of 3 cm and there is a fixed point P located on the ball. Let the person rolling the ball represent the origin. Find parametric equations defining the cycloid traced out by P.