

10.4 EXERCISES

PRACTICE

- Given the parametric equations $x = 5 + t$ and $y = \frac{\sqrt{t}}{(t-2)}$, construct a table of the points (x, y) that result from integer t -values from 0 to 6, and then sketch the curve.
- Given the parametric equations $x = \frac{\tan \theta}{2}$ and $y = \cos^2 \theta + 3$, construct a table of the points (x, y) that result from the values $\theta = 0, \frac{\pi}{6}, \frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{5\pi}{6}$, 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.

- $x = 3(t+1)$ and $y = 2t$
- $x = 1 + t$ and $y = \frac{t-3}{2}$
- $x = \frac{t}{4}$ and $y = t^2$
- $x = \sqrt{t+3}$ and $y = t+3$
- $x = \cos \theta$ and $y = 2\sin \theta$
- $x = 1 - \sin \theta$ and $y = \sin \theta - 1$
- $x = 2\sin \theta + 2$ and $y = 2\cos \theta + 2$
- $x = \sqrt{t-2}$ and $y = 3t - 2$
- $x = |t+3|$ and $y = t - 5$
- $x = \frac{t}{t+2}$ and $y = \sqrt{t}$
- $x = \frac{2}{|t-3|}$ and $y = 2t - 1$
- $x = 3\sin \theta - 1$ and $y = \frac{\cos \theta}{2}$
- $x = 2\cos \theta$ and $y = 3\cos \theta$
- $x = \sin \theta$ and $y = 4 - 3\cos \theta$

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

- $y = (x+1)^2$
- $x^2 + \frac{y^2}{4} = 1$
- $y = \frac{1}{x}$
- $x = 2(y-3)$
- $y = x^2 - x - 6$
- $y = 5x - 2$
- $x = y^2 + 4$
- $x = 4y - 6$
- $y^2 = 1 - x^2$
- $y = -x^2 - 5$
- $y = x^2 + 1$
- $y = |x-1|$
- $x = \frac{1}{3y}$

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

- Slope -2 , passing through $(-5, -2)$
- Slope $\frac{1}{4}$, passing through $(10, 12)$
- Slope 3 , passing through $(7, 2)$
- Passing through $(0, 0)$ and $(7, 4)$
- Passing through $(6, -3)$ and $(2, 3)$
- 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.

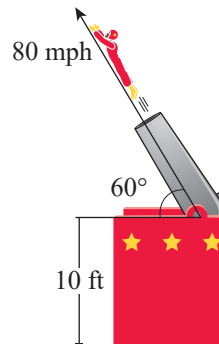
36. $y = 3x + 1$, given that $x = 2 + t$ 37. $y = 2 - |x|$, given that $x = t - 5$
 38. $y = 5 - x^2$, given that $x = t + 1$ 39. $5 = 2y + x$, given that $x = 4t$
 40. $\frac{x^2}{2} + 6 = y$, given that $x = t - 4$ 41. $(x - 2)^2 = y$, given that $x = 5t + 1$

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.
- Construct parametric equations representing the path of the ball.
 - Sketch a graph of the basketball's flight.
 - 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.



- Construct parametric equations representing the performer's path as he flies through the air.
- Sketch a graph of his flight.
- How high is the acrobat 1.5 seconds after leaving the cannon?
- How far from the cannon should a landing net be placed, if it is placed at ground level?
- At what time t will the performer land in the net?
- 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 ft/s and is tossed at an angle of 10° from the horizontal.
- Construct parametric equations modeling the path of the newspaper.
 - 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 .