



# 4.1 Graphing Equations in Slope-Intercept Form

## Slope-Intercept Form

### Slope-Intercept Form

$y = mx + b$ , where  $m$  is the slope and  $b$  is the  $y$ -intercept

### EXAMPLE Write an Equation in Slope-Intercept Form

Write an equation in slope-intercept form for the line with a slope of  $-4$  and a  $y$ -intercept of  $3$ .

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = -4x + 3 \quad \text{Replace } m \text{ with } -4 \text{ and } b \text{ with } 3.$$

Slope-intercept form makes it easier to graph a linear equation.

### EXAMPLE Graph a Line

Graph  $3x - 4y = 8$ .

$$3x - 4y = 8$$

Original equation

$$-4y = -3x + 8$$

Subtract  $3x$  from each side.

$$\frac{-4y}{-4} = \frac{-3x + 8}{-4}$$

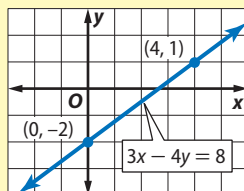
Divide each side by  $-4$ .

$$y = \frac{3}{4}x - 2$$

Simplify.

The  $y$ -intercept of  $y = \frac{3}{4}x - 2$  is  $-2$  and the slope is  $\frac{3}{4}$ .

- Graph the point  $(0, -2)$ .
- From this point, move up 3 units and right 4 units.
- Draw a line passing through both points.



## Modeling Real-World Data

### EXAMPLE Write and Graph a Linear Equation

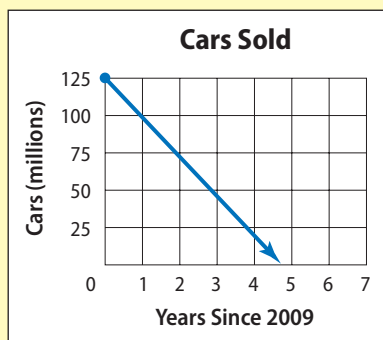
**CARS** Since 2009, the number of cars of a certain model sold has decreased by an average rate of 27 million per year. There were 124 million of these cars sold in 2009.

- a. Write a linear equation to find the average number of these cars sold in any year after 2009.

The rate of change is  $-27$  million per year. In the first year, the number of the cars sold was 124 million. Let  $N$  = the number of millions of cars sold. Let  $x$  = the number of years since 2009. An equation is  $N = -27x + 124$ .

- b. Graph the equation.

The graph of  $N = -27x + 124$  is a line that passes through the point at  $(0, 124)$  and has a slope of  $-27$ .



- c. Find the approximate number of cars sold in 2013.

$$N = -27x + 124 \quad \text{Original equation}$$

$$N = -27(4) + 124 \quad \text{Replace } x \text{ with 4.}$$

$$N = 16 \quad \text{Simplify.}$$

**Approximately** 16 million cars of this model sold in 2013.

- d. Estimate when the number of cars sold is zero.

$$N = -27x + 124 \quad \text{Original equation}$$

$$0 = -27x + 124 \quad \text{Replace } N \text{ with 0.}$$

$$27x = 124 \quad \text{Add } 27x \text{ to each side.}$$

$$x = 4.59 \quad \text{Divide each side by 27.}$$

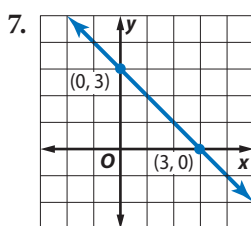
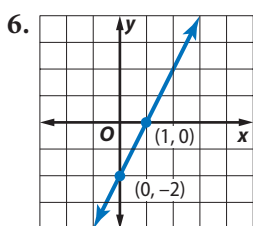
After 2013, sales hit zero.

## 4.1 Exercises

Write an equation of a line in slope-intercept form with the given slope and  $y$ -intercept.

1. slope 8,  $y$ -intercept  $-3$
2. slope  $-2$ ,  $y$ -intercept  $-1$
3. slope  $-1$ ,  $y$ -intercept  $-7$
4. slope  $-4$ ,  $y$ -intercept  $-2$
5. slope 0,  $y$ -intercept 1

Write an equation in slope-intercept form for each graph shown.



Graph each equation.

8.  $y = 2x + 1$
  9.  $y = -3x + 2$
  10.  $y = -x - 1$
  11.  $y = -2x + 3$
12. **MUSIC** In 2001, full-length cassettes represented 3.4% of total music sales. Between 2001 and 2006, the percent decreased by about 0.5% per year.
- a. Write an equation to find the percent  $P$  of recorded music sold as full-length cassettes for any year  $x$  between 2001 and 2006.
  - b. Graph the equation.
  - c. Find the percent of recorded music sold as full-length cassettes in 2004.
  - d. If the pattern continued, what percent of recorded music sold was full-length cassettes in 2012?
  - e. What is the slope of the line? What does it represent?
  - f. What is the  $y$ -intercept of the line? What does it represent?