

## 4-2

## Graphing Linear Functions


**Check Skills You'll Need**

1. **Vocabulary Review**  
Explain how to find the *slope* of a line.

Find the slope of the line that passes through each pair of points.

- (2, 4), (-5, 10)
- (0, 0), (6, 0)
- (2, 1), (1, 2)



**CONTENT STANDARDS**

8.EE.6, 8.F.1, 8.F.3, 8.F.4

**What You'll Learn**

To use tables and equations to graph linear functions

**New Vocabulary** *y*-intercept, slope-intercept form, linear function

**Why Learn This?**

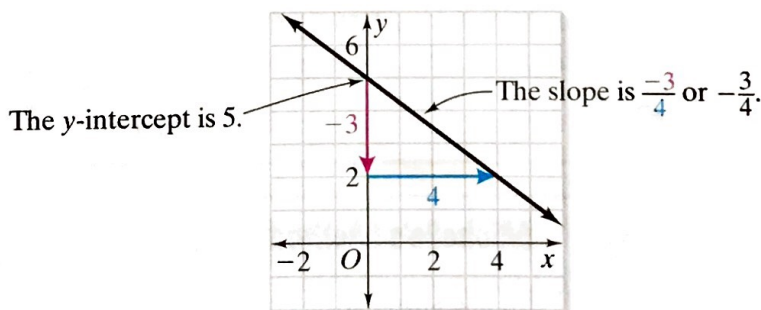
The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. These ordered pairs are the solutions of the equation. A graph of a line may include solutions that do not appear in a table of values of the equation.

The ***y*-intercept** is the point where the graph crosses the *y*-axis.

$$y = -\frac{3}{4}x + 5$$

↑ ↑  
slope *y*-intercept

Below is the graph of  $y = -\frac{3}{4}x + 5$ .



Notice that the slope and *y*-intercept may be part of the equation of a line.

An equation written in the form  $y = mx + b$  is in **slope-intercept form**. The graph is a line with slope  $m$  and *y*-intercept  $b$ .

A **linear function** is a function with points that lie on a line. You can write a linear function in the form  $y = mx + b$ . Then you can use the slope and *y*-intercept to graph the function.



**Video Tutor Help**

PearsonSuccessNet.com

## EXAMPLE Finding Slope and y-intercept

1 Find the slope and y-intercept of the graph of the function.

a.  $y = 2x + 4$

$$y = \underset{\uparrow}{m}x + \underset{\uparrow}{b} \leftarrow \begin{array}{l} m \text{ represents slope} \\ b \text{ represents the} \\ \text{y-intercept} \end{array}$$

The slope is 2 and the y-intercept is 4.

b.  $y = -\frac{5}{6}x - 7$

$$y = \underset{\uparrow}{m}x + \underset{\uparrow}{b} \leftarrow \begin{array}{l} m \text{ represents slope} \\ b \text{ represents the} \\ \text{y-intercept} \end{array}$$

The slope is  $-\frac{5}{6}$  and the y-intercept is  $-7$ .

### Quick Check

1. Find the slope and y-intercept of the graph of  $y = x - 3$ .

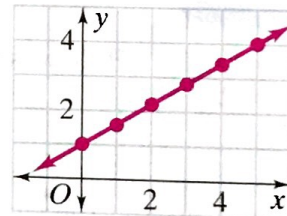
### More Than One Way

Graph the function  $y = \frac{3}{5}x + 1$ .

#### Kevin's Method

First I will make a table. Then I will graph the points.

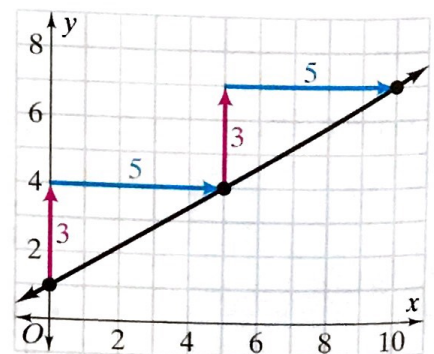
x	0	1	2	3	4	5
y	1	1.6	2.2	2.8	3.4	4



#### Michelle's Method

I can use slope-intercept form to graph the equation.

The y-intercept is 1 and the slope is  $\frac{3}{5}$ .

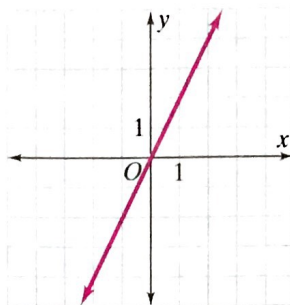


#### Choose a Method

Graph the function  $y = -\frac{2}{3}x - 2$ . Explain why you chose the method you used.



Below is the graph of  $y = 2x$ .



Notice that the slope of the line is  $\frac{2}{1}$ , or 2. Since the graph passes through the origin, the  $y$ -intercept is 0. So the equation of the line in slope-intercept form is  $y = 2x + 0$ , or  $y = 2x$ .

### KEY CONCEPTS Slope-Intercept Form of a Linear Equation

- The slope-intercept form of a line that intersects the  $y$ -axis at  $b$  is  $y = mx + b$ .
- The slope-intercept form of a line that intersects the  $y$ -axis at the origin is  $y = mx$ .

### EXAMPLE

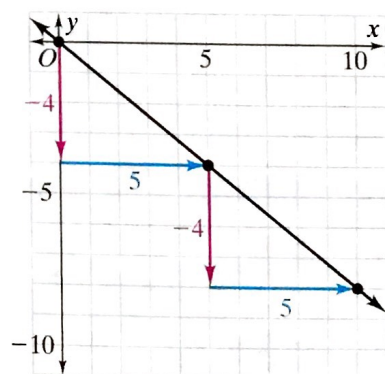
### Graphing Functions of the Form $y = mx$

- 2 **Science** The temperature of a substance in degrees Celsius before and during an experiment is given by the function  $y = -\frac{4}{5}x$  where  $y$  represents temperature and  $x$  represents time in minutes. Graph  $y = -\frac{4}{5}x$ .

**Step 1** The  $y$ -intercept is 0, so plot a point at  $(0, 0)$ .

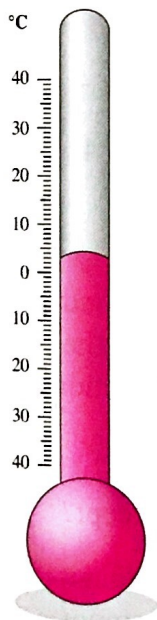
**Step 2** The slope is  $-\frac{4}{5}$ . Move down 4 units and right 5 units. Plot another point. Repeat to find another point on the line.

**Step 3** Draw a line through the three points.

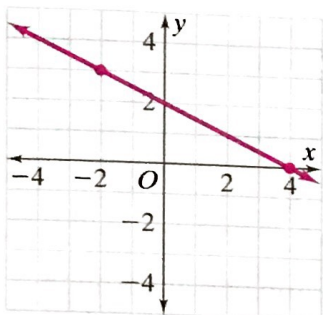


### Quick Check

2. Graph the function  $y = \frac{1}{5}x$ .



# Check Your Understanding



- Vocabulary** What is the  $y$ -intercept of the graph of a line?
- What is the slope and  $y$ -intercept of the graph at the left?

For each function, find the slope and the  $y$ -intercept.

- $y = 4x - 1$
- $y = x + 4$
- Make a table for the function  $y = 3x$ . Then graph the function.

# Homework Exercises

**GO for Help**

For Exercises	See Examples
6–16	1
17–19	2

For more exercises, see Extra Skills and Word Problems.

Find the slope and  $y$ -intercept of the graph of the function.

- $y = 3x - 4$
- $y = 8x + 2$
- $y = \frac{1}{4}x - 5$
- $y = -\frac{2}{5}x + 7$
- $y = 12x$
- $y = x$

Graph each linear function.

- $y = -2x + 5$
- $y = \frac{2}{3}x - 1$
- $y = -\frac{3}{5}x - 2$
- $y = 3x - 7$
- $y = -6x - 1$
- $y = x + 4$
- $y = 5x$
- $y = -6x$
- $y = \frac{1}{3}x$

**GPS**



**21. Guided Problem Solving** A woman makes necklaces and sells them at a jewelry show. She pays \$10.00 to have a table at the show and makes \$20.25 for each necklace she sells. Write a function for the money she earns and graph the function.

- What is the input variable? What is the output variable?
- What is the slope of this function? What is the  $y$ -intercept?

**22. Writing in Math** Describe a relation in your daily life that is a function. Explain why it is a function and define the input and the output.

**23. Nutrition** The label at the right shows the nutrition facts for a package of crackers. Find how many Calories are in one cracker. The number of Calories consumed is a function of the number of crackers eaten. Make a table and a graph for the function.

Amount Per Serving	
<b>Calories</b> 140	Calories from Fat 35
% Daily Value	
<b>Total Fat</b> 4g	6%
Saturated Fat 1g	5%
Monounsaturated Fat 1.5g	

24. Aman is 3.5 years older than his sister Dalia. Make a table and graph the function relating Aman's age to Dalia's age.
25. **Internet** Company A charges a fee of \$5.00 per month plus \$2.00 for each hour of Internet use. Company B charges \$10.00 per month plus \$1.00 for each hour of Internet use. Graph two functions to show how the total cost each month depends on the hours of usage for each company.
26. **Challenge** Suppose gasoline costs \$2.30 per gallon at one gas station and \$2.35 at another. Graph two functions showing how the cost to fill a car's gas tank depends on the number of gallons of gas it needs. For how many gallons of gasoline is there a price difference of \$0.30 between the two functions?

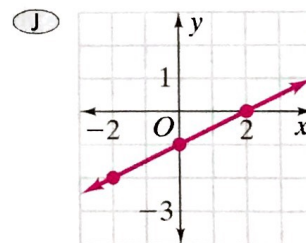
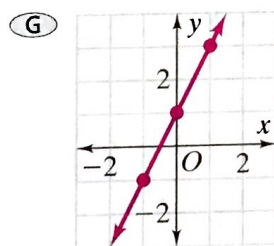
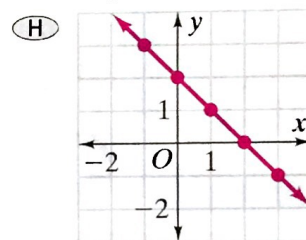
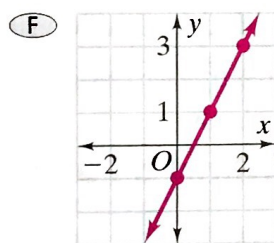


**Test Prep and Mixed Review**

**Practice**

**Multiple Choice**

27. Which of the following is a graph of the equation  $y = 2x - 1$ ?



28. Which of the following inequalities is true?

(A)  $\sqrt{2} > \pi$  (B)  $\pi > \sqrt{5}$  (C)  $\sqrt{5} > \pi$  (D)  $\pi^2 < \sqrt{7}$

29. Which table represents a linear function?

(F) 

x	1	3	5	7
y	4	9	14	19

(H) 

x	-5	-3	-1	1
y	-3	-1	0	3

(G) 

x	2	4	6	8
y	4	6	9	15

(J) 

x	0	2	5	9
y	1	3	5	7

30. Sophia earns \$12.00 per hour working in an office plus \$5 for parking fees. She uses the function  $e = 12h + 5$  to represent her daily earnings, where  $e$  represents her earnings and  $h$  represents the number of hours she works. Explain whether or not the function has a proportional relationship.

**GO for Help**

For Exercise	See Lesson
30	3-3