

## 8-5 Determining an Equation of a Line

**Objective:** To find an equation of a line given the slope and one point on the line, or given two points on the line.

### Vocabulary

**x-intercept** The  $x$ -coordinate of the point where a line crosses the  $x$ -axis.

**Example 1** Write an equation of a line that has slope 3 and  $y$ -intercept 2.

**Solution** Substitute 3 for  $m$  and 2 for  $b$  in  $y = mx + b$ .  
The equation is  $y = 3x + 2$ .

Write an equation in slope-intercept form of each line described.

- |  |  |
|--|--|
| 1. slope 2; $y$ -intercept 3                 | 2. slope $-4$ ; $y$ -intercept 2               |
| 3. slope $\frac{1}{2}$ ; $y$ -intercept 5    | 4. slope $\frac{1}{3}$ ; $y$ -intercept 6      |
| 5. slope $-\frac{1}{2}$ ; $y$ -intercept 4   | 6. slope $-\frac{1}{4}$ ; $y$ -intercept 4     |
| 7. slope $\frac{2}{3}$ ; $y$ -intercept $-6$ | 8. slope 3; $y$ -intercept $-7$                |
| 9. slope $-5$ ; $y$ -intercept 2             | 10. slope $-\frac{2}{5}$ ; $y$ -intercept $-1$ |

**Example 2** Write an equation of a line that has slope  $-2$  and passes through  $(5, 0)$ .

**Solution**

- Substitute  $-2$  for  $m$  in  $y = mx + b$   
 $y = -2x + b$
- To find  $b$ , substitute 5 for  $x$  and 0 for  $y$  in  $y = -2x + b$ .  
 $y = -2x + b$   
 $0 = -2(5) + b$   
 $0 = -10 + b$   
 $10 = b$

The equation is  $y = -2x + 10$ .

Write an equation in slope-intercept form of each line described.

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|--|--|
| 11. slope 2; passes through $(3, -1)$                | 12. slope 3; passes through $(-1, 2)$              |
| 13. slope $-4$ ; passes through $(2, 3)$             | 14. slope $-2$ ; passes through $(-3, 1)$          |
| 15. slope $\frac{2}{3}$ ; passes through $(0, 3)$    | 16. slope $-\frac{4}{3}$ ; passes through $(1, 0)$ |
| 17. slope $-\frac{3}{5}$ ; passes through $(-1, -4)$ | 18. slope $-1$ ; passes through $(3, 1)$           |
| 19. slope 0; passes through $(\frac{1}{4}, 2)$       | 20. slope 0; passes through $(-2, \frac{3}{8})$    |

**8-5 Determining an Equation of a Line** (continued)

**Example 3** Write an equation of the line passing through the points  $(-3, 2)$  and  $(1, -2)$ .

**Solution** 1. Find the slope: 
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 2}{1 - (-3)}$$
$$= \frac{-4}{4} = -1$$

Substitute  $-1$  for  $m$  in  $y = mx + b$ .

$$y = -x + b$$

2. Choose one of the points, say  $(-3, 2)$ .

Substitute  $-3$  for  $x$  and  $2$  for  $y$ .

$$y = -x + b$$

$$2 = -(-3) + b$$

$$2 = 3 + b$$

$$-1 = b$$

The equation is  $y = -x - 1$ .

**Write an equation in slope-intercept form of the line passing through the given points.**

21.  $(4, 5), (2, 1)$

22.  $(-1, 2), (4, 7)$

23.  $(1, 2), (4, 4)$

24.  $(3, 4), (4, 6)$

25.  $(3, 1), (5, 2)$

26.  $(0, -2), (-3, 2)$

27.  $(0, -1), (-2, 3)$

28.  $(6, 4), (2, 1)$

29.  $(-2, 8), (1, 2)$

30.  $(0, 3), (-1, 0)$

31.  $(-1, 3), (2, 0)$

32.  $(1, -7), (2, -1)$

**Write an equation in slope-intercept form for each line described.**

33.  $y$ -intercept  $-1$ ;  $x$ -intercept  $4$

34.  $y$ -intercept  $-4$ ;  $x$ -intercept  $1$

35.  $x$ -intercept  $-4$ ;  $y$ -intercept  $-3$

36. horizontal line through  $(-1, -2)$

37. horizontal line through  $(2, 4)$

38. vertical line through  $(-1, -2)$

**Mixed Review Exercises**

**Simplify.**

1.  $\left(\frac{2}{5}t^2\right)(10t^3)$

2.  $\frac{1}{3}(6s^2 - 9st)$

3.  $(6pq^2)^2$

4.  $(-2m^2n^3)^4$

5.  $2 \cdot 5 - 3^2$

6.  $(2a^2b^3)(-3ab^2)$

7.  $2 \cdot (6 - 1)^2$

8.  $(6x + 2y) - (x + y)$