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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

1. Substitute -2 for m in $y = mx + b$
$$y = -2x + b$$

2. 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.

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 $\left(\frac{1}{4}, 2\right)$
20. slope 0; passes through $\left(-2, \frac{3}{8}\right)$

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