The Slope-Intercept Equation of a Line

In Exercises 5–10, solve for y.

5. $5x + 7y = 0$ 6. $2x - 4y = 0$ 7. $3x + 4y = 12$

8. $-4x + 5y = 8$ 9. $y + 10 = 0$ 10. $y - 12 = 0$

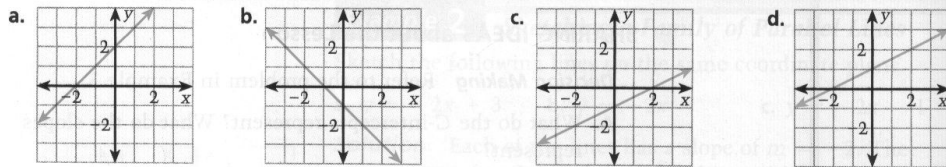In Exercises 11–16, find the slope and the y-intercept of the line.

11. $y = -2x + 1$ 12. $y = 3x - 6$ 13. $y = -4 + (-8x)$

14. $y = 4x - 20$ 15. $x - y = 3x + 4$ 16. $2y - x = 7x - 9$

In Exercises 17–28, write in slope-intercept form. Then sketch the line.

17. $2x - y - 3 = 0$ 18. $x - y + 2 = 0$ 19. $x + y = 0$

20. $x - y = 0$ 21. $x + 2y - 2 = 0$ 22. $3x - 2y - 2 = 0$

23. $3x - 4y + 2 = 0$ 24. $10x + 6y - 3 = 0$ 25. $y - 3 = 0$

26. $y + 5 = 0$ 27. $2x + 3y - 4 = x + 5$ 28. $-x + 4y + 3 = 2x - 7$

In Exercises 29–32, match the equation with its graph.

29. $y = \frac{1}{2}x + 1$ 30. $y = \frac{1}{2}x - 1$ 31. $y = x + 2$ 32. $y = -x - 1$

a. b. c. d.

In Exercises 33–36, sketch the two lines on the same coordinate plane. Find the slope and x- and y-intercepts of the lines.

33. $y = -3x + 2$, $y = -3x - 2$

34. $y = -x + 6$, $v = -x + 10$

In Exercises 35–38, sketch the line that passes through the given points. Use the graph to estimate the y-intercept of the line. Then find the actual y-intercept. See margin.

35. $(3, -3), (-6, 0)$ -2 36. $(1, 1), (-3, -1)$ $\frac{1}{2}$ 37. $(1, 1), (-5, -3)$ $\frac{1}{3}$ 38. $(1, 2), (-4, 7)$

Answers

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

6. $y = \frac{1}{2}x$

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

8. $y = \frac{4}{5}x + \frac{8}{5}$

9. $y = -10$

10. $y = 12$

11. $-2, 1$

12. $3, -6$

13. $-8, -4$

14. $4, -20$

15. $-2, -4$

16. $4, -\frac{9}{2}$

17. $y = 2x - 3$

18. $y = x + 2$

19. $y = -x$

20. $y = x$

21. $y = -\frac{x}{2} + 1$

22. $y = \frac{3}{2}x - 1$

23. $y = \frac{3}{4}x + \frac{1}{2}$

24. $y = -\frac{5}{3}x + \frac{1}{2}$

25. $y = 3$

26. $y = -6$

27. $y = -\frac{x}{3} + 3$

28. $y = \frac{3}{4}x - \frac{5}{2}$

29. d

30. c

31. a

32. b

33. $-3; (\frac{2}{3}, 0), (0, 2), (-\frac{2}{3}, 0), (0, -2)$

34. $-1; (6, 0), (0, 6), (10, 0), (0, 10)$

Exercises 9–20, write an equation of the line that passes through the point and has the given slope. Write the equation in slope-intercept form.

9. $(-3, 6), m = 2$ $y = 2x + 12$

10. $(3, 2), m = 1$ $y = x - 1$

11. $(4, -2), m = -1$ $y = -x + 2$

12. $(3, 1), m = -3$ $y = -3x + 10$

13. $(-2, -5), m = -2$

14. $(1, 4), m = 4$

15. $(4, -2), m = \frac{1}{2}$

16. $(-6, 5), m = \frac{1}{3}$

17. $(0, -1), m = 3$ $y = 3x - 1$

18. $(0, 4), m = 2$ $y = 2x + 4$

19. $(2, 5), m = 0$ $y = 0 \cdot x + 5$

20. $(1, -3), m = 0$ $y = 0 \cdot x - 3$

Exercises 21–26, write the slope-intercept form of the equation of the line.

21. The line has a slope of $\frac{2}{3}$ and passes through the point $(-3, 4)$. $y = \frac{2}{3}x + 6$

22. The line has a slope of $-\frac{1}{4}$ and passes through the point $(8, 3)$. $y = -\frac{1}{4}x + 5$

23. 24. 25. 26.

$y = -2x - 2$ $y = \frac{1}{3}x + 2$ $y = \frac{1}{2}x + 2$ $y = x + 1$
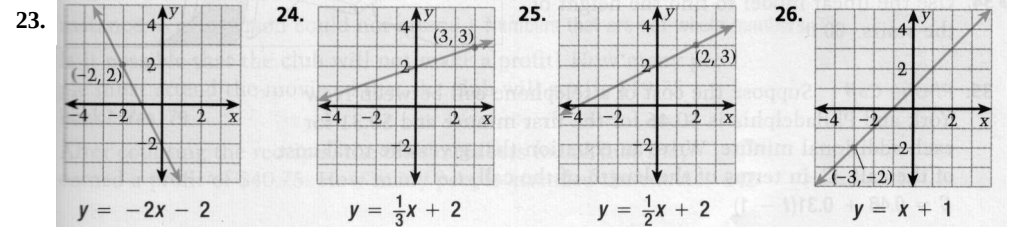
In Exercises 7–10, write the slope-intercept form of the equation of the line.

7. 8. 9. 10.

$y = x - 1$ $y = -2x + 3$ $y = 3x + 13$ $y = -\frac{1}{2}x - 1$
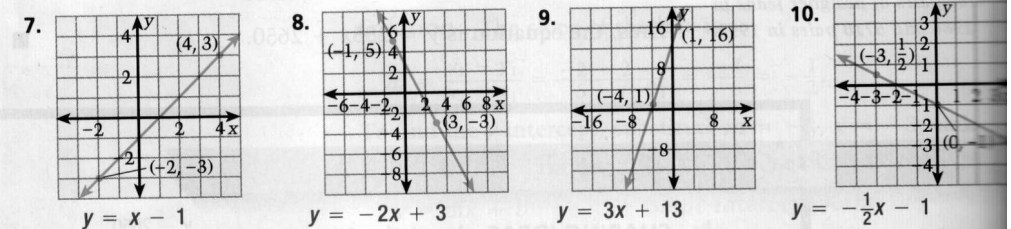
In Exercises 11–22, write the slope-intercept form of the equation of the line that passes through the two points. See below.

11. $(-1, -1), (2, 8)$ 12. $(1, 2), (4, -1)$ 13. $(2, 0), (-4, -3)$ $y = \frac{1}{2}x - 1$ 14. $(3, 1), (-3, 5)$ $y = -\frac{2}{3}x$

15. $(1, -4), (-2, 8)$ 16. $(0, -4), (3, 2)$ 17. $(2, -5), (-1, 1)$ 18. $(-2, -1), (4, 2)$

19. $(1, 1), (4, 4)$ $y = x$ 20. $(1, 2), (2, 4)$ $y = 2x$ 21. $(1, 3), (3, 3)$ $y = 3$ 22. $(-1, -2), (3, -2)$

23. Sketch the line that passes through $(2, 6)$ and $(-4, 3)$. Write its equation in slope-intercept form. $y = \frac{1}{2}x + 5$. See margin.

24. Sketch the line that passes through $(3, -3)$ and $(-3, 1)$. Write its equation in slope-intercept form. $y = -\frac{2}{3}x - 1$. See margin.

25. Write an equation of the line whose x-intercept is -6 and whose y-intercept is -4. $y = -\frac{2}{3}x - 4$

26. Write an equation of the line whose x-intercept is -1 and whose y-intercept is 3. $y = 3x + 3$

11. $y = 3x + 2$ 12. $y = -x + 3$ 15. $y = -4x$ 16. $y = 2x - 4$ 17. $y = -2x - 1$

In Exercises 43–46, determine whether the given three points lie on the same line. If they do, find an equation of the line.

43. $(-3, -1), (0, 1), (12, 9)$ They do, $y = \frac{2}{3}x + 1$ ✪ 44. $(4, -2), (-1, 2), (-8, 9)$ They do not.

45. $(-2, -1), (3, 2), (7, 5)$ They do not. ✪ 46. $(3, -3), (-1, 13), (1, 5)$ They do, $y = -4$

In Exercises 1 – 9, solve the equation. Check your solution both algebraically and graphically.

1. $2x + 3 = 7$
2. $3x - 2 = -5$
3. $4x - 7 = -23$
4. $x - 9 = -6$
5. $5x + 17 = -13$
6. $5x - 17 = 8$
7. $4x + 3 = 5$
8. $5x + 7 = 9$
9. $9x - 6 = -10$

Word Problems

27. Find an equation of the line that crosses the x-axis at (3, 0) with a slope of $-\frac{1}{3}$.

28. Find an equation of the line that crosses the x-axis at $(-2, 0)$ with a slope of 2.
    y = 2x + 4

27. **y = $-\frac{1}{3}$x + 1**

29. *Hockey Attendance*   Between 1980 and 1990, the attendance at National Hockey League games increased by about 1,100,000 people per year. In 1989, 20,434,000 people attended National Hockey League games. Find an equation that gives the attendance, y, at National Hockey League games in terms of the year, x. Let x = 0 correspond to 1980. *(Source: National Hockey League)* **y = 1,100,000x + 10,534,000**

30. *Cable Television Subscribers*   Between 1980 and 1990, the number of cable television subscribers increased by about 3600 per year. In 1987, there were 41,100 cable television subscribers. Find an equation that gives the number, y, of cable television subscribers, in terms of the year, x. Let x = 0 correspond to 1980. *(Source: Television and Cable Factbook)* **y = 3600x + 15,900**

31. *Profit from Shoe Sales*   A shoe store made a profit of $14,510 in 1988 and a profit of $21,260 in 1993. Write an equation that gives the profit, y, in terms of the year, x. Let x = 0 correspond to 1980 and assume that the profit followed a linear pattern. **y = 1350x + 3710**

32. *Bookstore Sales*   A bookstore sold 576 copies of dictionaries in 1984 and 792 copies in 1992. Write an equation that gives the number, d, of dictionaries sold in terms of the year, t. Let t = 0 correspond to 1980 and assume that the sales followed a linear pattern. **d = 27t + 468**

33. *Newspaper Circulation*   In 1975, Sunday newspapers in the United States had a circulation of 51,096,000. In 1985, the circulation had increased to 58,826,000. Write an equation that gives the Sunday circulation, y, in terms of the year, x. Let x = 0 correspond to 1970 and assume that circulation followed a linear pattern. *(Source: American Newspaper Publishers Association)* **y = 773,000x + 47,231,000**

34. *Population of Western United States*   In 1950, the population of the western United States was 20,190,000. In 1980, the population was 43,200,000. Write an equation that gives the population, y, in terms of the year, x. Let x = 0 correspond to 1950 and assume that the population followed a linear pattern. *(Source: U.S. Bureau of Census)* **y = 767,000x + 20,190,000**

39. Find an equation of the line that passes through the point $(-4, 11)$ and has the same y-intercept as the line given by $y = -\frac{2}{3}x + 3$. **y = -2x + 3**

40. Find an equation of the line that passes through the point (3, 7) and has the same y-intercept as the line given by $y = \frac{1}{2}x - 5$. **y = 4x - 5**

41. Find an equation of the line that passes through the point $(3, -4)$ and is parallel to the line passing through the points $(-4, -1)$ and (2, 5). **y = x - 7**

42. Find an equation of the line that passes through the point $(4, -5)$ and is parallel to the line passing through the points (2, 0) and $(-2, -2)$. **y = $\frac{1}{2}$x - 7**

Linear Functions

In Exercises 5–8, match the function with its graph.

5. $f(x) = 3x - 5$
6. $f(x) = 2x + 2$
7. $f(x) = -\frac{1}{2}x + 4$
8. $f(x) = -3x - 4$

a.

b.

c.

d.

In Exercises 9–14, find the slope of the graph of the linear function f.

9. $f(2) = -3$, $f(-2) = 5$
10. $f(0) = 1$, $f(1) = 0$
11. $f(-3) = -9$, $f(3) = 4$
12. $f(6) = -1$, $f(3) = 8$
13. $f(9) = -1$, $f(-1) = 2$
14. $f(-1) = 1$, $f(1) = 6$

In Exercises 15–26, find an equation for the linear function f.

15. $f(0) = 1$, $f(2) = 1$
16. $f(2) = -2$, $f(-4) = 1$
17. $f(3) = -4$, $f(5) = 2$
18. $f(0) = 5$, $f(-6) = 3$
19. $f(-1) = 1$, $f(-2) = -4$
20. $f(4) = 6$, $f(9) = 1$
21. $f(0) = 4$, $f(-3) = 6$
22. $f(3) = -2$, $f(5) = -2$
23. $f(6) = 2$, $f(9) = -1$
24. $f(2) = 10$, $f(-4) = 16$
25. $f(-5) = 5$, $f(5) = -3$
26. $f(7) = 2$, $f(3) = -8$

In Exercises 27–32, sketch the graph of the linear function.

27. $f(x) = -2x + 4$
28. $f(x) = -x + 3$
29. $f(x) = \frac{1}{2}x + 1$
30. $f(x) = 2x - 3$
31. $f(x) = -\frac{1}{3}x + 2$
32. $f(x) = 3x - 8$

Answers

5. c
6. a
7. d
8. b
9. -2
10. -1
11. $\frac{13}{6}$
12. -3
13. $-\frac{3}{10}$
14. $\frac{5}{2}$
15. $f(x) = 1$
16. $f(x) = -\frac{x}{2} - 1$
17. $f(x) = 3x - 13$
18. $f(x) = \frac{x}{3} + 5$
19. $f(x) = 5x + 6$
20. $f(x) = -x + 10$
21. $f(x) = -\frac{2}{3}x + 4$
22. $f(x) = -2$
23. $f(x) = -x + 8$
24. $f(x) = -x + 12$
25. $f(x) = \frac{5}{2}x - \frac{31}{2}$
26. $f(x) = -\frac{4}{5}x + 1$