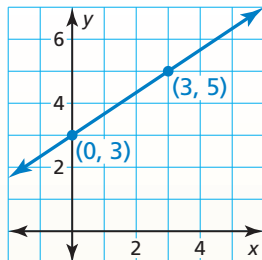## 4.1 Writing Equations in Slope-Intercept Form *(pp. 175–180)*

Write an equation of the line in slope-intercept form.
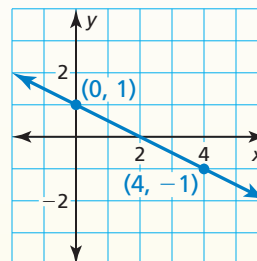
Find the slope and *y*-intercept.

Let $(x_1, y_1) = (0, 3)$ and $(x_2, y_2) = (3, 5)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{3 - 0} = \frac{2}{3}$$

Because the line crosses the *y*-axis at $(0, 3)$, the *y*-intercept is 3.

▶ So, the equation is $y = \frac{2}{3}x + 3$.

1. Write an equation of the line in slope-intercept form.

4.2 Writing Equations in Point-Slope Form *(pp. 181–186)*

Write an equation in point-slope form of the line that passes through the point $(-1, -8)$ and has a slope of 3.

$y - y_1 = m(x - x_1)$	Write the point-slope form.
$y - (-8) = 3[x - (-1)]$	Substitute 3 for *m*, -1 for x_1, and -8 for y_1.
$y + 8 = 3(x + 1)$	Simplify.

▶ The equation is $y + 8 = 3(x + 1)$.

2. Write an equation in point-slope form of the line that passes through the point $(4, 7)$ and has a slope of -1.

Write a linear function *f* with the given values.

3. $f(10) = 5, f(2) = -3$ **4.** $f(3) = -4, f(5) = -4$ **5.** $f(6) = 8, f(9) = 3$

4.3 Writing Equations of Parallel and Perpendicular Lines *(pp. 187–192)*

Determine which of the lines, if any, are parallel or perpendicular.

    Line *a*: $y = 2x + 3$ **Line *b*:** $2y + x = 5$ **Line *c*:** $4y - 8x = -4$

Write the equations in slope-intercept form. Then compare the slopes.

    Line *a*: $y = 2x + 3$ Line *b*: $y = -\frac{1}{2}x + \frac{5}{2}$ Line *c*: $y = 2x - 1$

▶ Lines *a* and *c* have slopes of 2, so they are parallel. Line *b* has a slope of $-\frac{1}{2}$, the negative reciprocal of 2, so it is perpendicular to lines *a* and *c*.

Determine which of the lines, if any, are parallel or perpendicular. Explain.

6. Line a passes through $(0, 4)$ and $(4, 3)$.
Line b passes through $(0, 1)$ and $(4, 0)$.
Line c passes through $(2, 0)$ and $(4, 4)$.

7. Line a: $2x - 7y = 14$
Line b: $y = \frac{7}{2}x - 8$
Line c: $2x + 7y = -21$

8. Write an equation of the line that passes through $(1, 5)$ and is parallel to the line $y = -4x + 2$.

9. Write an equation of the line that passes through $(2, -3)$ and is perpendicular to the line $y = -2x - 3$.

**4.4**   **Scatter Plots and Lines of Fit**   *(pp. 195–200)*

The scatter plot shows the roasting times (in hours) and weights (in pounds) of seven turkeys. Tell whether the data show a *positive*, a *negative*, or *no* correlation.

As the weight of a turkey increases, the roasting time increases.

▶ So, the scatter plot shows a positive correlation.

Roasting Turkeys

Use the scatter plot in the example.

10. What is the roasting time for a 12-pound turkey?

11. Write an equation that models the roasting time as a function of the weight of a turkey. Interpret the slope and y-intercept of the line of fit.
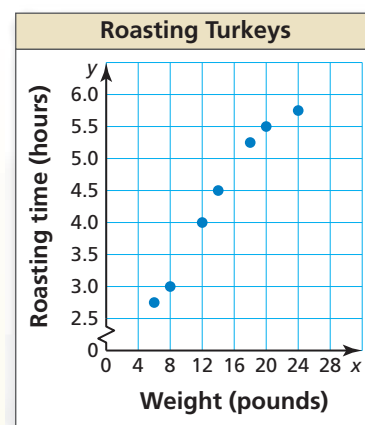
4.5   **Analyzing Lines of Fit**   *(pp. 201–208)*

The table shows the heights x (in inches) and shoe sizes y of several students. Use a graphing calculator to find an equation of the line of best fit. Identify and interpret the correlation coefficient.

Height, x	Shoe size, y
64	9
62	7
70	12
63	8
72	13
68	9.5
66	9
74	13.5
68	10
59	6.5

Step 1 Enter the data from the table into two lists.

Step 2 Use the *linear regression* feature.

```
LinReg
y=ax+b
a=.4989919355
b=-23.4828629
r²=.9477256904
r=.9735120392
```

▶ An equation of the line of best fit is
$y = 0.50x - 23.5$. The correlation coefficient is about 0.974. This means that the relationship between the heights and the shoe sizes has a strong positive correlation and the equation closely models the data.

12. Make a scatter plot of the residuals to verify that the model in the example is a good fit.

13. Use the data in the example. (a) Approximate the height of a student whose shoe size is 9. (b) Predict the shoe size of a student whose height is 60 inches.

14. Is there a causal relationship in the data in the example? Explain.

4.6 Arithmetic Sequences (pp. 209–216)

Write an equation for the nth term of the arithmetic sequence $-3, -5, -7, -9, \ldots$. Then find a_{20}.

The first term is -3, and the common difference is -2.

$a_n = a_1 + (n-1)d$ Equation for an arithmetic sequence

$a_n = -3 + (n-1)(-2)$ Substitute -3 for a_1 and -2 for d.

$a_n = -2n - 1$ Simplify.

Use the equation to find the 20th term.

$a_{20} = -2(20) - 1$ Substitute 20 for n.

$\phantom{a_{20}} = -41$ Simplify.

▶ The 20th term of the arithmetic sequence is -41.

Write an equation for the nth term of the arithmetic sequence. Then find a_{30}.

15. $11, 10, 9, 8, \ldots$ **16.** $6, 12, 18, 24, \ldots$ **17.** $-9, -6, -3, 0, \ldots$

## 4.7 Piecewise Functions (pp. 217–224)

Graph $y = \begin{cases} \frac{3}{2}x + 3, & \text{if } x \le 0 \\ -2x, & \text{if } x > 0 \end{cases}$. Describe the domain and range.

Step 1 Graph $y = \frac{3}{2}x + 3$ for $x \le 0$. Because x is less than or equal to 0, use a closed circle at $(0, 3)$.

Step 2 Graph $y = -2x$ for $x > 0$. Because x is not equal to 0, use an open circle at $(0, 0)$.

▶ The domain is all real numbers. The range is $y \le 3$.

$y = \frac{3}{2}x + 3, x \le 0$

$y = -2x, x > 0$

18. Evaluate the function in the example when (a) $x = 0$ and (b) $x = 5$.
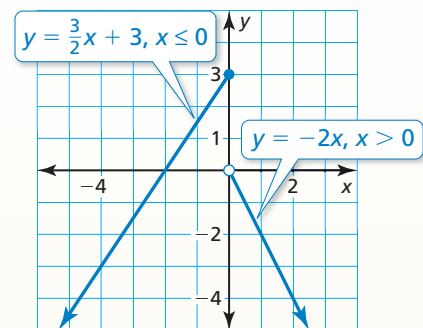
Graph the function. Describe the domain and range.

19. $y = \begin{cases} x + 6, & \text{if } x \le 0 \\ -3x, & \text{if } x > 0 \end{cases}$ **20.** $y = \begin{cases} 4x + 2, & \text{if } x < -4 \\ 2x - 6, & \text{if } x \ge -4 \end{cases}$

Write the absolute value function as a piecewise function.

21. $y = |x| + 15$ **22.** $y = 4|x + 5|$ **23.** $y = 2|x + 2| - 3$

24. You are organizing a school fair and rent a popcorn machine for 3 days. The rental company charges \$65 for the first day and \$35 for each additional day. Write and graph a step function that represents the relationship between the number x of days and the total cost y (in dollars) of renting the popcorn machine.