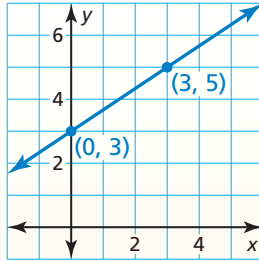


**4.1** Writing Equations in Slope-Intercept Form (pp. 175–180)

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



Find the slope and y-intercept.

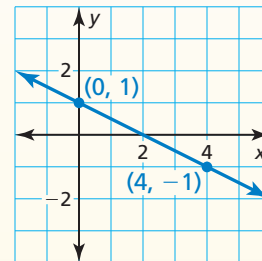
Let  $(x_1, y_1) = (0, 3)$  and  $(x_2, y_2) = (3, 5)$ .

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

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

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

- 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  $y + 8 = 3(x + 1)$ .

- 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  $(4, 3)$ .      7. Line  $a: 2x - 7y = 14$   
 Line  $b$  passes through  $(0, 1)$  and  $(4, 0)$ .      Line  $b: y = \frac{7}{2}x - 8$   
 Line  $c$  passes through  $(2, 0)$  and  $(4, 4)$ .      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)

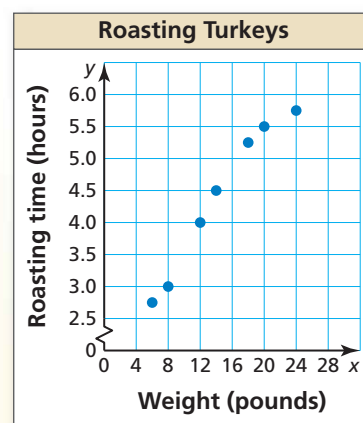
The scatter plot shows the roasting times (in hours) and weights (in pounds) of seven turkeys. Tell whether the data show a *positive*, a *negative*, or *no* correlation.

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

► So, the scatter plot shows a positive correlation.

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.

**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.

| 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            |

## 4.6 Arithmetic Sequences (pp. 209–216)

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

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

$$a_n = a_1 + (n - 1)d \quad \text{Equation for an arithmetic sequence}$$

$$a_n = -3 + (n - 1)(-2) \quad \text{Substitute } -3 \text{ for } a_1 \text{ and } -2 \text{ for } d.$$

$$a_n = -2n - 1 \quad \text{Simplify.}$$

Use the equation to find the 20th term.

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

$$= -41 \quad \text{Simplify.}$$

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

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

15.  $11, 10, 9, 8, \dots$

16.  $6, 12, 18, 24, \dots$

17.  $-9, -6, -3, 0, \dots$

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

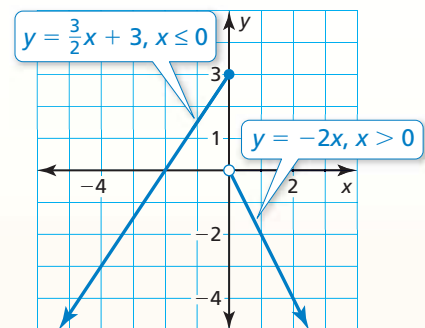
Graph  $y = \begin{cases} \frac{3}{2}x + 3, & \text{if } x \leq 0 \\ -2x, & \text{if } x > 0 \end{cases}$ . Describe the domain and range.

**Step 1** Graph  $y = \frac{3}{2}x + 3$  for  $x \leq 0$ . 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  $y \leq 3$ .

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



Graph the function. Describe the domain and range.

19.  $y = \begin{cases} x + 6, & \text{if } x \leq 0 \\ -3x, & \text{if } x > 0 \end{cases}$

20.  $y = \begin{cases} 4x + 2, & \text{if } x < -4 \\ 2x - 6, & \text{if } x \geq -4 \end{cases}$

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.

# 4 Chapter Test

Graph the function. Describe the domain and range.

$$1. y = \begin{cases} 2x + 4, & \text{if } x \leq -1 \\ \frac{1}{3}x - 1, & \text{if } x > -1 \end{cases}$$

$$2. y = \begin{cases} 1, & \text{if } 0 \leq x < 3 \\ 0, & \text{if } 3 \leq x < 6 \\ -1, & \text{if } 6 \leq x < 9 \\ -2, & \text{if } 9 \leq x < 12 \end{cases}$$

Write an equation in slope-intercept form of the line with the given characteristics.

3. slope =  $\frac{2}{5}$ ; y-intercept =  $-7$
4. passes through  $(0, 6)$  and  $(3, -3)$
5. parallel to the line  $y = 3x - 1$ ; passes through  $(-2, -8)$
6. perpendicular to the line  $y = \frac{1}{4}x - 9$ ; passes through  $(1, 1)$

Write an equation in point-slope form of the line with the given characteristics.

7. slope =  $10$ ; passes through  $(6, 2)$
8. passes through  $(-3, 2)$  and  $(6, -1)$
9. The first row of an auditorium has 42 seats. Each row after the first has three more seats than the row before it.
  - a. Find the number of seats in Row 25.
  - b. Which row has 90 seats?
10. The table shows the amount  $x$  (in dollars) spent on advertising for a neighborhood festival and the attendance  $y$  of the festival for several years.
  - a. Make a scatter plot of the data. Describe the correlation.
  - b. Write an equation that models the attendance as a function of the amount spent on advertising.
  - c. Interpret the slope and y-intercept of the line of fit.
11. Consider the data in the table in Exercise 10.
  - a. Use a graphing calculator to find an equation of the line of best fit.
  - b. Identify and interpret the correlation coefficient.
  - c. What would you expect the scatter plot of the residuals to look like?
  - d. Is there a causal relationship in the data? Explain your reasoning.
  - e. Predict the amount that must be spent on advertising to get 2000 people to attend the festival.

| Advertising (dollars), $x$ | Yearly attendance, $y$ |
|----------------------------|------------------------|
| 500                        | 400                    |
| 1000                       | 550                    |
| 1500                       | 550                    |
| 2000                       | 800                    |
| 2500                       | 650                    |
| 3000                       | 800                    |
| 3500                       | 1050                   |
| 4000                       | 1100                   |

12. Let  $a$ ,  $b$ ,  $c$ , and  $d$  be constants. Determine which of the lines, if any, are parallel or perpendicular. Explain.

Line 1:  $y - c = ax$

Line 2:  $ay = -x - b$

Line 3:  $ax + y = d$

13. Write a piecewise function defined by three equations that has a domain of all real numbers and a range of  $-3 < y \leq 1$ .