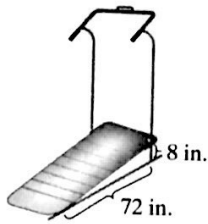
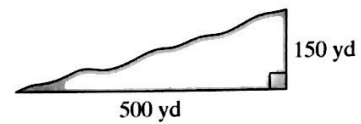


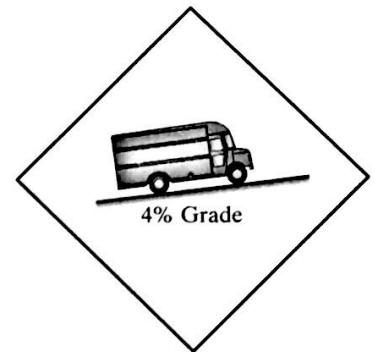
9. Find the slope of the treadmill.



10. Find the average slope of the hill.



11. The road sign shown in the figure indicates the percent grade of a hill. This gives the slope of the road as the change in elevation per 100 horizontal ft. Given a 4% grade, write this as a slope in fractional form.



12. If a plane gains 1000 ft in altitude over a distance of 12,000 horizontal ft, what is the slope? Explain what this value means in the context of the problem.

### Concept 2: The Slope Formula

For Exercises 13–30, use the slope formula to determine the slope of the line containing the two points. (See Examples 2–5.)

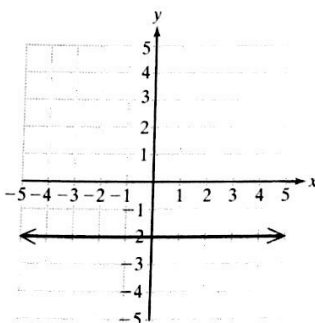
13.  $(6, 0)$  and  $(0, -3)$       14.  $(-5, 0)$  and  $(0, 4)$       15.  $(-2, 3)$  and  $(4, -7)$   
 16.  $(-5, -4)$  and  $(1, -7)$       17.  $(-2, 5)$  and  $(2, -3)$       18.  $(4, -2)$  and  $(6, -8)$   
 19.  $(0.3, -1.1)$  and  $(-0.1, -0.8)$       20.  $(0.4, -0.2)$  and  $(0.3, -0.1)$       21.  $(2, 3)$  and  $(2, 7)$   
 22.  $(-1, 5)$  and  $(-1, 0)$       23.  $(5, -1)$  and  $(-3, -1)$       24.  $(-8, 4)$  and  $(1, 4)$   
 25.  $(-4.6, 4.1)$  and  $(0, 6.4)$       26.  $(1.1, 4)$  and  $(-3.2, -0.3)$       27.  $(\frac{3}{2}, \frac{4}{3})$  and  $(\frac{7}{2}, 1)$   
 28.  $(\frac{2}{3}, -\frac{1}{2})$  and  $(-\frac{1}{6}, -\frac{3}{2})$       29.  $(\frac{3}{4}, \frac{7}{3})$  and  $(\frac{1}{2}, 2\frac{1}{3})$       30.  $(\frac{9}{4}, \frac{2}{5})$  and  $(2\frac{1}{4}, \frac{1}{10})$

31. Explain how to use the graph of a line to determine whether the slope of a line is positive, negative, zero, or undefined.

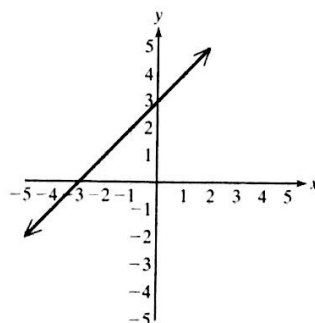
32. If the slope of a line is  $\frac{4}{3}$ , how many units of change in  $y$  will be produced by 6 units of change in  $x$ ?

For Exercises 33–38, estimate the slope of the line from its graph.

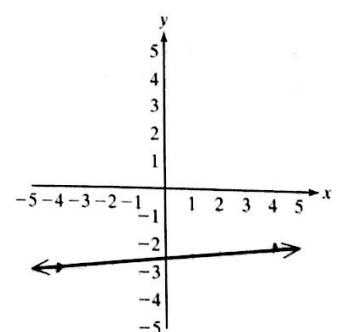
33.



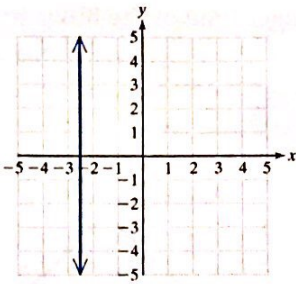
34.



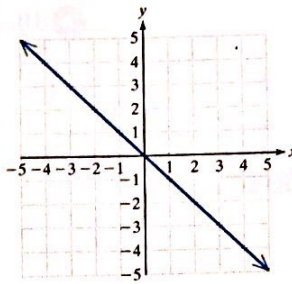
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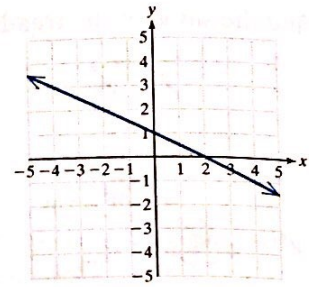
36.



37.



38.

**Concept 3: Parallel and Perpendicular Lines**

For Exercises 39–44, the slope of a line is given.

- Find the slope of a line parallel to the given line.
- Find the slope of a line perpendicular to the given line. (See Example 6.)

39.  $m = 5$

40.  $m = 3$

41.  $m = -\frac{4}{7}$

42.  $m = -\frac{2}{11}$

43.  $m = 0$

44.  $m$  is undefined.

- Can the slopes of two perpendicular lines both be positive? Explain your answer.
- Suppose a line is defined by the equation  $x = 2$ . What is the slope of a line perpendicular to this line?
- Suppose a line is defined by the equation  $y = -5$ . What is the slope of a line perpendicular to this line?
- Suppose a line is defined by the equation  $x = -3$ . What is the slope of a line parallel to this line?
- What is the slope of a line parallel to the  $x$ -axis?
- What is the slope of a line perpendicular to the  $y$ -axis?
- What is the slope of a line perpendicular to the  $x$ -axis?
- What is the slope of a line parallel to the  $y$ -axis?

In Exercises 53–60, two points are given from each of two lines  $L_1$  and  $L_2$ . Without graphing the points, determine if the lines are parallel, perpendicular, or neither. (See Example 7.)

53.  $L_1: (2, 5)$  and  $(4, 9)$   
 $L_2: (-1, 4)$  and  $(3, 2)$

54.  $L_1: (-3, -5)$  and  $(-1, 2)$   
 $L_2: (0, 4)$  and  $(7, 2)$

55.  $L_1: (4, -2)$  and  $(3, -1)$   
 $L_2: (-5, -1)$  and  $(-10, -16)$

56.  $L_1: (0, 0)$  and  $(2, 3)$   
 $L_2: (-2, 5)$  and  $(0, -2)$

57.  $L_1: (5, 3)$  and  $(5, 9)$   
 $L_2: (4, 2)$  and  $(0, 2)$

58.  $L_1: (3, 5)$  and  $(2, 5)$   
 $L_2: (2, 4)$  and  $(0, 4)$

59.  $L_1: (-3, -2)$  and  $(2, 3)$   
 $L_2: (-4, 1)$  and  $(0, 5)$

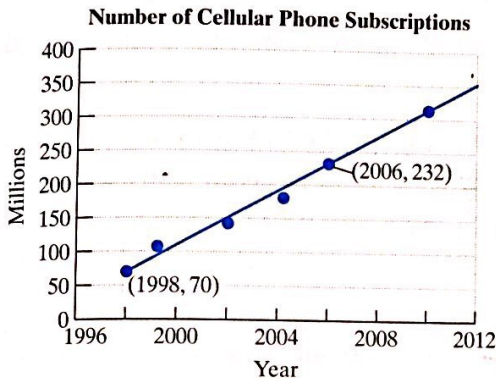
60.  $L_1: (7, 1)$  and  $(0, 0)$   
 $L_2: (-10, -8)$  and  $(4, -6)$



**Concept 4: Applications and Interpretation of Slope**

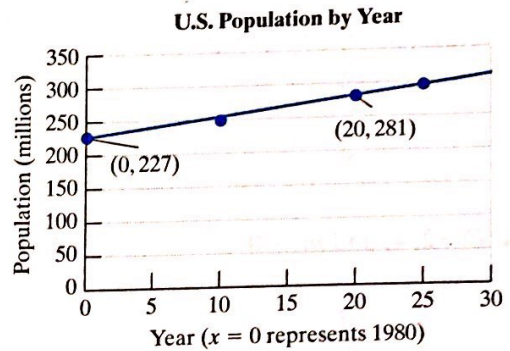
61. The graph shows the number of cellular phone subscriptions (in millions) purchased in the United States for selected years. (See Example 8.)

- a. Use the coordinates of the given points to find the slope of the line, and express the answer in decimal form.
- b. Interpret the meaning of the slope in the context of this problem.



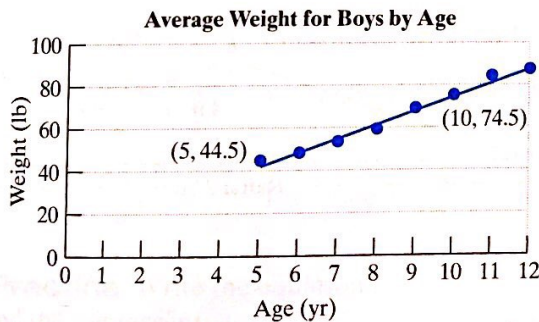
62. The U.S. population (in millions) has grown approximately linearly since 1980.

- a. Find the slope of the line defined by the two given points.
- b. Interpret the meaning of the slope in the context of this problem.



63. The data in the graph show the average weight for boys based on age.

- a. Use the coordinates of the given points to find the slope of the line.
- b. Interpret the meaning of the slope in the context of this problem.



64. The data in the graph show the average weight for girls based on age.

- a. Use the coordinates of the given points to find the slope of the line, and write the answer in decimal form.
- b. Interpret the meaning of the slope in the context of this problem.

