

**Solution**

We already have a point (actually, two) on the line, but we still need the slope to use the point-slope form. We can calculate this using the two points and the slope formula.

$$m = \frac{-2-6}{-3-1} = \frac{-8}{-4} = 2$$

Now we can substitute into the point-slope form, then solve for  $y$  to obtain the desired slope-intercept equation.

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 6 &= 2(x - 1) \\ y - 6 &= 2x - 2 \\ y &= 2x + 4 \end{aligned}$$

Note that no matter which point we substitute into the point-slope form, the resulting slope-intercept equation is the same.

We close this section with a summary of the different forms of linear equations, what information we need to write them, and what they are each most useful for.

**Standard Form:**  $ax + by = c$

Information Required: Typically, we arrive at the standard form when given a linear equation in another form.

Potential Uses: The standard form is most useful for easily calculating the  $x$ - and  $y$ -intercepts.

**Slope-Intercept Form:**  $y = mx + b$

Information Required: The slope  $m$  and the  $y$ -intercept  $(0, b)$ .

Potential Uses: The slope-intercept form makes it very easy to find the  $y$ -intercept and slope, and therefore to graph the line.

**Point-Slope Form:**  $y - y_1 = m(x - x_1)$

Information Required: The slope  $m$  and a point on the line  $(x_1, y_1)$  or two points on the line  $(x_1, y_1)$  and  $(x_2, y_2)$ .

Potential Uses: The point-slope form allows us to find the equation for a line when the  $y$ -intercept is unknown.

**2.3 EXERCISES****💡 PRACTICE**

Determine the slope of the line passing through the specified points. See Example 1.

- $(0, -3)$  and  $(-2, 5)$
- $(-3, 2)$  and  $(7, -10)$
- $(4, 5)$  and  $(-1, 5)$
- $(3, -1)$  and  $(-7, -1)$

5.  $(3, -5)$  and  $(3, 2)$                       6.  $(0, 0)$  and  $(-2, 5)$
7.  $(-2, 1)$  and  $(-5, -1)$                       8.  $\left(\frac{1}{2}, -7\right)$  and  $\left(\frac{3}{4}, -5\right)$
9.  $\left(10, \frac{1}{5}\right)$  and  $\left(4, -\frac{4}{5}\right)$                       10.  $(-2, 4)$  and  $(6, 9)$
11.  $(0, -21)$  and  $(-3, 0)$                       12.  $(-3, -5)$  and  $(-2, 8)$
13.  $\left(\frac{1}{3}, 9\right)$  and  $(2, 4)$                       14.  $(29, -17)$  and  $(31, -29)$
15.  $(7, 4)$  and  $(-6, 13)$

Determine the slopes of the lines defined by the following equations. See Example 2.

16.  $8x - 2y = 11$                                       17.  $2x + 8y = 11$
18.  $12x - 4y = -9$                                       19.  $4y = 13$
20.  $\frac{x-y}{3} + 2 = 4$                                       21.  $7x = 2$
22.  $3y - 2 = \frac{x}{5}$                                       23.  $3 - y = 2(5 - x)$
24.  $3(2y - 1) = 5(2 - x)$                                       25.  $\frac{x+2}{3} + 2(1 - y) = -2x$
26.  $2y - 7x = 4y + 5x$                                       27.  $x - 7 = \frac{2y - 1}{-5}$

Use the slope-intercept form to graph the equations. See Example 3.

28.  $6x - 2y = 4$                       29.  $3y + 2x - 9 = 0$                       30.  $5y - 15 = 0$
31.  $x + 4y = 20$                       32.  $\frac{x-y}{2} = -1$                       33.  $3x + 7y = 8y - x$
34.  $-4x - 4y = 8$                       35.  $-5x + 3y + 16 = 0$                       36.  $3x = 3y - 21$

Find the equation, in slope-intercept form, of the line with the given  $y$ -intercept and slope. See Example 4.

37.  $y$ -intercept  $(0, -3)$ ; slope of  $\frac{3}{4}$                       38.  $y$ -intercept  $(0, 5)$ ; slope of  $-3$
39.  $y$ -intercept  $(0, -7)$ ; slope of  $-\frac{5}{2}$                       40.  $y$ -intercept  $(0, 6)$ ; slope of  $4$
41.  $y$ -intercept  $(0, -9)$ ; slope of  $-5$                       42.  $y$ -intercept  $(0, 2)$ ; slope of  $\frac{1}{2}$

Find the equation, in standard form, of the line passing through the given point with the given slope.

43. point  $(-1, -3)$ ; slope of  $\frac{3}{2}$

44. point  $(6, 0)$ ; slope of  $\frac{5}{4}$

45. point  $(-3, 5)$ ; slope of 0

46. point  $(-2, -13)$ ; undefined slope

47. point  $(3, -1)$ ; slope of 10

48. point  $(-1, 3)$ ; slope of  $-\frac{2}{7}$

49. point  $(5, 11)$ ; slope of  $-3$

50. point  $(5, -9)$ ; slope of  $-\frac{1}{2}$

Find the equation, in standard form, of the line passing through the specified points.

51.  $(-1, 3)$  and  $(2, -1)$

52.  $(1, 3)$  and  $(-2, 3)$

53.  $(2, -2)$  and  $(2, 17)$

54.  $(-9, 2)$  and  $(1, 5)$

55.  $(3, -1)$  and  $(8, -1)$

56.  $(\frac{4}{3}, 1)$  and  $(\frac{2}{5}, \frac{3}{7})$

57.  $(-2, 8)$  and  $(5, 6)$

58.  $(8, -10)$  and  $(8, 0)$

59.  $(7, 5)$  and  $(-9, 5)$

60.  $(7, 7)$  and  $(9, -8)$

61.  $(\frac{2}{3}, \frac{5}{4})$  and  $(\frac{3}{5}, \frac{9}{8})$

62.  $(-5, -5)$  and  $(10, -11)$

Match each equation or description to the correct graph.

63.  $-3x - 2y = 17$

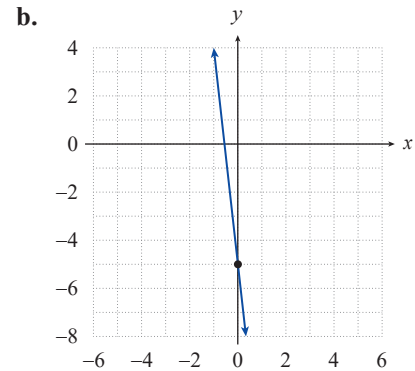
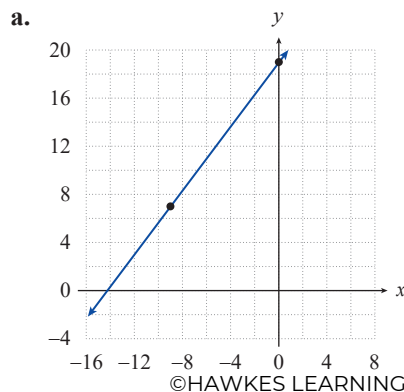
64.  $-4y + 10 = -4x$

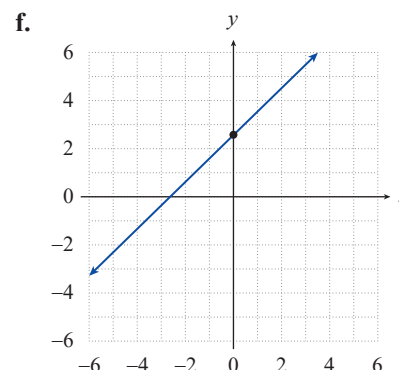
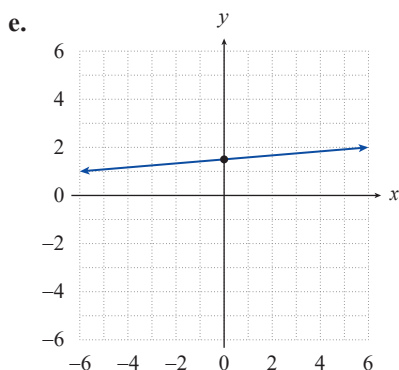
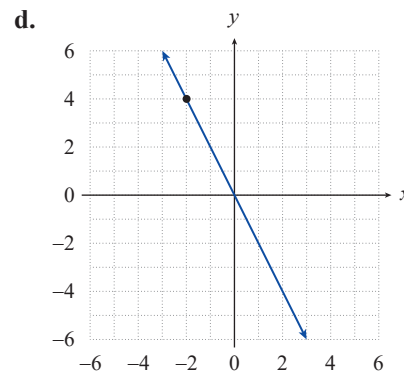
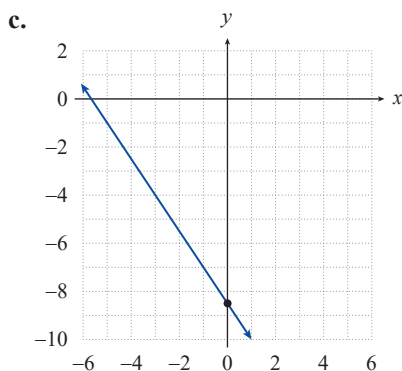
65.  $-6y + 9 = \frac{x}{-2}$

66. point  $(-9, 7)$ ; slope  $\frac{4}{3}$

67. point  $(-2, 4)$ ; slope  $-2$

68. point  $(0, -5)$ ; slope  $-9$





### APPLICATIONS

69. A bottle manufacturer has determined that the total cost ( $C$ ) in dollars of producing  $x$  bottles is  $C = 0.25x + 2100$ .
- What is the cost of producing 500 bottles?
  - What are the fixed costs (costs incurred even when 0 bottles are produced)?
  - What is the increase in cost for each bottle produced?
70. Sales at Glover's Golf Emporium have been increasing linearly for the past couple of years. Last year, sales were \$163,000. This year, sales were \$215,000. If sales continue to increase at this linear rate, predict the sales for next year.
71. Amy owns stock in a company. If the stock had a value of \$2500 in 2018 when she purchased it, what has been the average change in value per year if in 2020 the stock was worth \$3150?
72. For tax and accounting purposes, businesses often have to depreciate equipment values over time. One method of depreciation is the straight-line method. Three years ago Hilde Construction purchased a bulldozer for \$51,500. Using the straight-line method, the bulldozer has now depreciated to a value of \$43,200. If  $V$  equals the value at the end of year  $t$ , write a linear equation expressing the value of the bulldozer over time. How many years from the purchase date will the value equal \$0? Round your answer to two decimal places.