

Section 2.4 Equations of Lines

1. $y = \frac{2}{3}x + 2$ matches graph (b).

3. $y = -\frac{3}{2}x + 2$ matches graph (a).

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

$3(x-2) = y-5$

$3x-6 = y-5$

$3x-y = 1$

7. $-\frac{1}{2} = \frac{y-1}{x-(-3)}$

$x+3 = -2(y-1)$

$x+3 = -2y+2$

$x+2y = -1$

9. $\frac{4}{5} = \frac{y-(-1)}{x-\frac{3}{4}}$

$4\left(x-\frac{3}{4}\right) = 5(y+1)$

$4x-3 = 5y+5$

$4x-5y = 8$

11. $y-0 = -\frac{1}{2}(x-0)$

$y = -\frac{1}{2}x$

13. $y+4 = 3(x-0)$

$y+4 = 3x$

15. $y-6 = -\frac{3}{4}(x-0)$

$y-6 = -\frac{3}{4}x$

17. $y-8 = -2[x-(-2)]$

$y-8 = -2(x+2)$

19. $y-(-7) = \frac{5}{4}[x-(-4)]$

$y+7 = \frac{5}{4}(x+4)$

21. $y-\frac{7}{2} = -4[x-(-2)]$

$y-\frac{7}{2} = -4(x+2)$

23. $y-\frac{5}{2} = \frac{4}{3}\left(x-\frac{3}{4}\right)$

25. $y-(-1) = 0(x-2)$

$y+1 = 0$

27. $m = \frac{3-0}{2-0} = \frac{3}{2}$

$y-0 = \frac{3}{2}(x-0)$

$y = \frac{3}{2}x$

$2y = 3x$

$3x-2y = 0$

29. $m = \frac{0-4}{4-0} = \frac{-4}{4} = -1$

$y-4 = -1(x-0)$

$y-4 = -x$

$x+y-4 = 0$

31. $m = \frac{0-3}{4-(-2)} = \frac{-3}{6} = \frac{-1}{2}$

$y-0 = \frac{-1}{2}(x-4)$

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

$2y = -x + 4$

$x+2y-4 = 0$

33. $m = \frac{-2-2}{5+5} = \frac{-4}{10} = \frac{-2}{5}$

$y-2 = -\frac{2}{5}(x+5)$

$y-2 = -\frac{2}{5}x - 2$

$y = -\frac{2}{5}x$

$5y = -2x$

$2x+5y = 0$

$$35. m = \frac{4-3}{\frac{9}{2}-\frac{3}{2}} = \frac{1}{\frac{6}{2}} = \frac{1}{3}$$

$$y - 3 = \frac{1}{3}\left(x - \frac{3}{2}\right)$$

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

$$6y - 18 = 2x - 3$$

$$2x - 6y + 15 = 0$$

$$39. m = \frac{-1.4 - 9}{8 - 5} = \frac{-10.4}{3} = \frac{-104}{30} = \frac{-52}{15}$$

$$y - 9 = \frac{-52}{15}(x - 5)$$

$$y - 9 = \frac{-52}{15}x + \frac{52}{3}$$

$$15y - 135 = -52x + 260$$

$$52x + 15y - 395 = 0$$

$$43. m = \frac{5-2}{4+2} = \frac{3}{6} = \frac{1}{2}$$

$$y - 5 = \frac{1}{2}(x - 4)$$

$$y - 5 = \frac{1}{2}x - 2$$

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

49. $y = 6$ because every y -coordinate is 6.

$$53. 6x - 2y = 3 \quad \text{slope} = 3$$

$$-2y = -6x + 3$$

$$y = 3x - \frac{3}{2}$$

$$(a) y - 1 = 3(x - 2)$$

$$y - 1 = 3x - 6$$

$$y = 3x - 5$$

$$(b) y - 1 = -\frac{1}{3}(x - 2)$$

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

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

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

$$37. m = \frac{\frac{7}{4} - \frac{1}{2}}{\left(\frac{3}{2}\right) - 10} \cdot \frac{4}{4} = \frac{7-2}{6-40} = \frac{5}{-34}$$

$$y - \frac{1}{2} = -\frac{5}{34}(x - 10)$$

$$y - \frac{1}{2} = -\frac{5}{34}x + \frac{50}{34}$$

$$34y - 17 = -5x + 50$$

$$5x + 34y - 67 = 0$$

$$41. m = \frac{-4.2 - 0.6}{8 - 2} = \frac{-4.8}{6} = -0.8$$

$$y - 0.6 = -0.8(x - 2)$$

$$y - 0.6 = -0.8x + 1.6$$

$$0.8x + y - 2.2 = 0$$

$$8x + 10y - 22 = 0$$

$$4x + 5y - 11 = 0$$

$$45. m = \frac{3-3}{4+2} = \frac{0}{6} = 0$$

$$y - 3 = 0(x - 4)$$

$$y - 3 = 0$$

$$y = 3$$

47. $x = -1$ because every x -coordinate is -1 .

51. $x = -7$ because both points have an x -coordinate of -7 .

$$55. 5x + 4y = 24$$

$$4y = -5x + 24$$

$$y = -\frac{5}{4}x + 6 \quad \text{slope} = -\frac{5}{4}$$

$$(a) y - 4 = -\frac{5}{4}[x - (-5)]$$

$$y - 4 = -\frac{5}{4}(x + 5)$$

$$y - 4 = -\frac{5}{4}x - \frac{25}{4}$$

$$y = -\frac{5}{4}x - \frac{25}{4} + \frac{16}{4}$$

$$y = -\frac{5}{4}x - \frac{9}{4}$$

$$(b) y - 4 = \frac{4}{5}[x - (-5)]$$

$$y - 4 = \frac{4}{5}(x + 5)$$

$$y - 4 = \frac{4}{5}x + 4$$

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

57. $4x - y - 3 = 0$ slope = 4

$$4x - 3 = y$$

(a) $y - 7 = 4(x - 3)$

$$y - 7 = 4x - 12$$

$$y = 4x - 5$$

(b) $y - 7 = -\frac{1}{4}(x - 3)$

$$y - 7 = -\frac{1}{4}x + \frac{3}{4}$$

$$y = -\frac{1}{4}x + \frac{3}{4} + \frac{28}{4}$$

$$y = -\frac{1}{4}x + \frac{31}{4}$$

61. $y + 5 = 0$

$$y = -5 \quad \text{The slope is zero.}$$

(a) $y - 2 = 0(x + 1)$

$$y - 2 = 0$$

(b) $x = -1$

$$x + 1 = 0$$

65. $\frac{x}{a} + \frac{y}{b} = 1, a \neq 0, b \neq 0$

$$\frac{x}{-5} + \frac{y}{-7} = 1$$

$$-\frac{6x}{5} - \frac{3y}{7} = 1$$

69. $M = \frac{200,000 - 500,000}{2 - 5}$

$$= \frac{-300,000}{-3}$$

$$= 100,000$$

$$S - 500,000 = 100,000(t - 5)$$

$$S - 500,000 = 100,000t - 500,000$$

$$S = 100,000t$$

$$S = 100,000(6) = \$600,000$$

59. $x - 5 = 0$

$$x = 5 \quad \text{The slope is undefined.}$$

(a) $x = \frac{2}{3}$

$$x - \frac{2}{3} = 0 \text{ or}$$

$$3x - 2 = 0$$

(b) $y = \frac{4}{3}$

$$y - \frac{4}{3} = 0 \text{ or}$$

$$3y - 4 = 0$$

63. $\frac{x}{a} + \frac{y}{b} = 1, a \neq 0, b \neq 0$

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

67. $M = \frac{6000 - 5000}{50 - 0} = \frac{1000}{50} = 20$

$$C - 5000 = 20(x - 0)$$

$$C = 20x + 5000$$

$$C = 20(400) + 5000$$

$$= \$13,000$$

71. $M = \frac{1530 - 1500}{1000 - 0}$

$$= \frac{30}{1000}$$

$$= \frac{3}{100}$$

$$S - 1500 = \frac{3}{100}(M - 0)$$

$$S = \frac{3}{100}M + 1500 \text{ or}$$

$$S = 0.03M + 1500$$

$$0.03 = 3\%$$

73. (a) $S = 0.70L$

(b) $S = 0.70(135)$

$S = \$94.50$

75. (a) $(0, 7400) \quad (4, 1500)$

$$m = \frac{7400 - 1500}{0 - 4} = \frac{5900}{-4} = -1475$$

$V - 7400 = -1475(t - 0)$

$V - 7400 = -1475t$

$V = -1475t + 7400$

(b) $V = -1475(2) + 7400$

$V = -2950 + 7400$

$V = 4450$

Thus, after 2 years, the photocopier has a value of \$4450.

77. (a) $N = 1500 + 60t$

(b) $N = 1500 + 60(15)$

$= 1500 + 900$

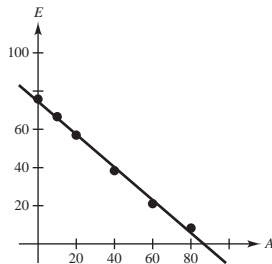
$= 2400$

(c) $N = 1500 + 60(5)$

$= 1500 + 300$

$= 1800$

79. (a) & (b)



(c) Two points taken from the “best-fitting” line sketched in part (b) are 0 and 10.

$$m = \frac{38.3 - 21.1}{40 - 60} = \frac{17.2}{-20} = -0.86$$

$E - 38.3 = -0.86(A - 40)$

$E = -0.86A + 72.7$

$E = -0.86A + 74.56$

(d) $E = -0.86(30) + 74.56$

$E = -25.8 + 74.56$

$E \approx 48.8$ years

81. $(0, 0), (40, 5)$

$$m = \frac{5 - 0}{40 - 0} = \frac{5}{40} = \frac{1}{8}$$

$y - 0 = \frac{1}{8}(x - 0)$

$y = \frac{1}{8}x$

$8y = x$

$x - 8y = 0$

Distance from deep end	0	8	16	24	32	40
Depth of water	9	8	7	6	5	4

—CONTINUED—

81. —CONTINUED—Depth of water = $9 - y$

(a) Depth = $9 - y$

$9 = 9 - y$

$0 = y$

$x - 8(0) = 0$

$x = 0$

(b) Depth = $9 - y$

$8 = 9 - y$

$-1 = -y$

$1 = y$

$x - 8(1) = 0$

$x = 8$

(c) Depth = $9 - y$

$7 = 9 - y$

$-2 = -y$

$2 = y$

$x - 8(2) = 0$

$x = 16$

(d) Depth = $9 - y$

$6 = 9 - y$

$-3 = -y$

$3 = y$

$x - 8(3) = 0$

$x = 24$

(e) Depth = $9 - y$

$5 = 9 - y$

$-4 = -y$

$4 = y$

$x - 8(4) = 0$

$x = 32$

(f) Depth = $9 - y$

$4 = 9 - y$

$-5 = -y$

$5 = y$

$x - 8(5) = 0$

$x = 40$

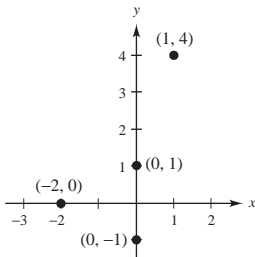
83. Yes. When different pairs of points are selected, the change in y and the change in x are the lengths of the sides of similar triangles. Corresponding sides of similar triangles are proportional.

85. In the equation $y = 3x + 5$, 3 is the slope and 5 is the y -intercept.

Section 2.5 Relations and Functions

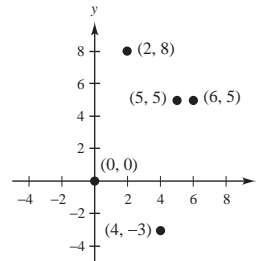
1. Domain = $\{-2, 0, 1\}$

Range = $\{-1, 0, 1, 4\}$



3. Domain = $\{0, 2, 4, 5, 6\}$

Range = $\{-3, 0, 5, 8\}$



5. $(3, 150), (2, 100), (8, 400), (6, 300), (\frac{1}{2}, 25)$

7. $(1, 1), (2, 8), (3, 27), (4, 64), (5, 125), (6, 216), (7, 343)$

9. (1995, Atlanta Braves), (1996, New York Yankees), (1997, Florida Marlins), (1998, New York Yankees)

11. No, this relation is not a function because -1 in the domain is paired to 2 numbers (6 and 7) in the range.

13. Yes, this relation is a function as each number in the domain is paired with exactly one number in the range.

15. No, this relation is not a function as 0 in the domain is paired with 2 numbers in the range (5 and 9).