

Algebra and in-class worksheet, Chapter 1.4
Equations of Lines and Modeling

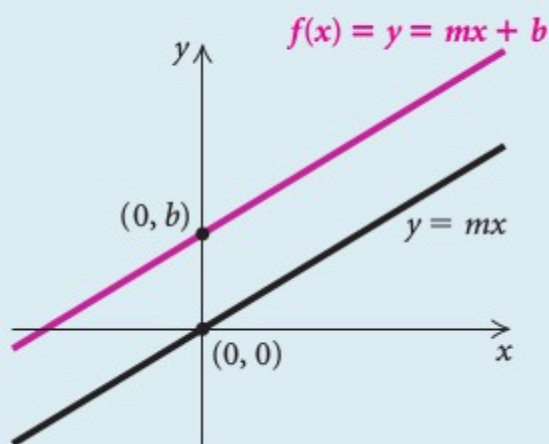
Section 1-4 in a nut shell:

The Slope–Intercept Equation

The linear function f given by

$$f(x) = mx + b$$

has a graph that is a straight line parallel to $y = mx$. The constant m is called the slope, and the y -intercept is $(0, b)$.



Point–Slope Equation

The **point–slope equation** of the line with slope m passing through (x_1, y_1) is

$$y - y_1 = m(x - x_1).$$

Parallel Lines

Vertical lines are **parallel**. Nonvertical lines are **parallel** if and only if they have the same slope and different y -intercepts.

Perpendicular Lines

Two lines with slopes m_1 and m_2 are **perpendicular** if and only if the product of their slopes is -1 :

$$m_1 m_2 = -1.$$

Lines are also **perpendicular** if one is vertical ($x = a$) and the other is horizontal ($y = b$).

Find the slope and y-intercept of the equation

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

2. $f(x) = -2x + 3$

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

4. $y = \frac{4}{7}$

5. $f(x) = 5 - \frac{1}{2}x$

6. $y = 2 + \frac{3}{7}x$

7. $3x + 2y = 10$

8. $2x - 3y = 12$

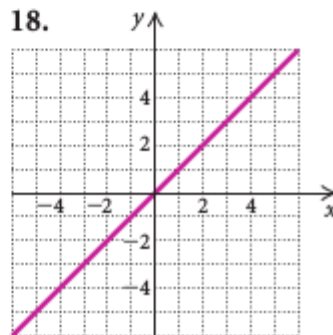
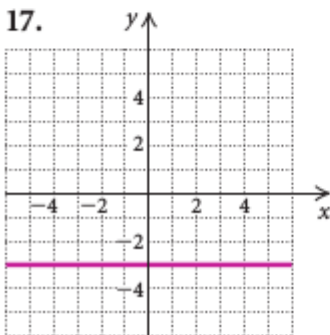
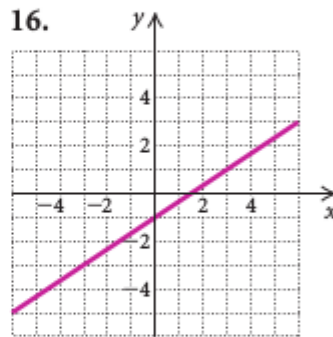
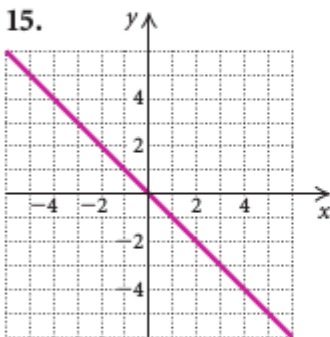
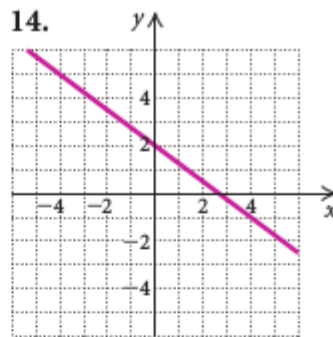
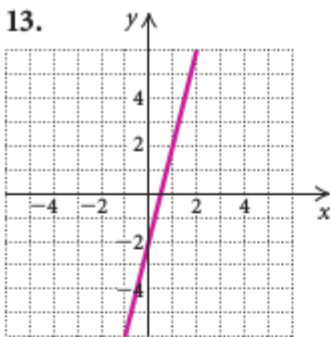
9. $y = -6$

10. $x = 10$

11. $5y - 4x = 8$

12. $5x - 2y + 9 = 0$

Pick off the slope and y-intercept from the graph. Then write as an equation



Graph the equation using the slope and y-intercept. (*Shortcut hint: just find the x-intercept and y-intercept. Plot those two points. Draw a line between 'em*)

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

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

21. $f(x) = 3x - 1$

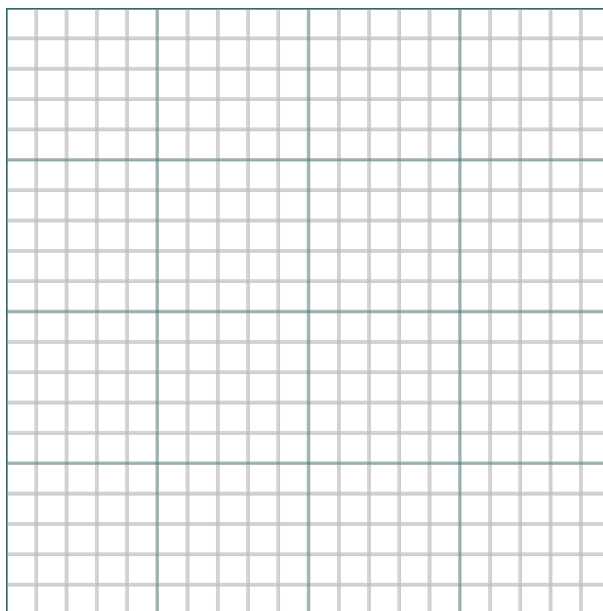
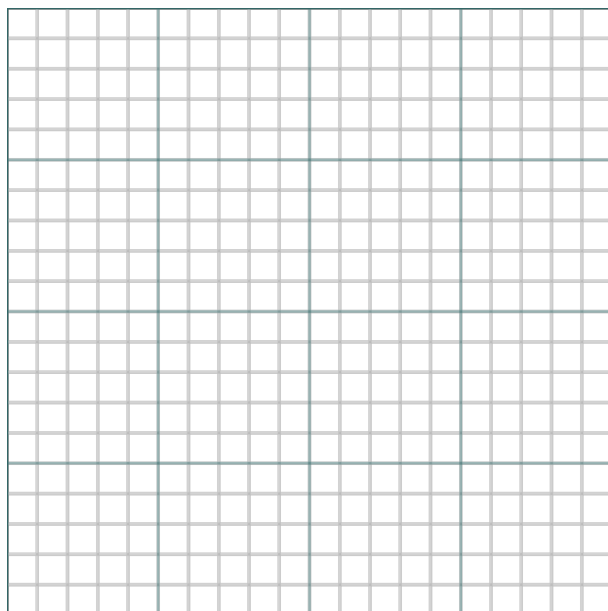
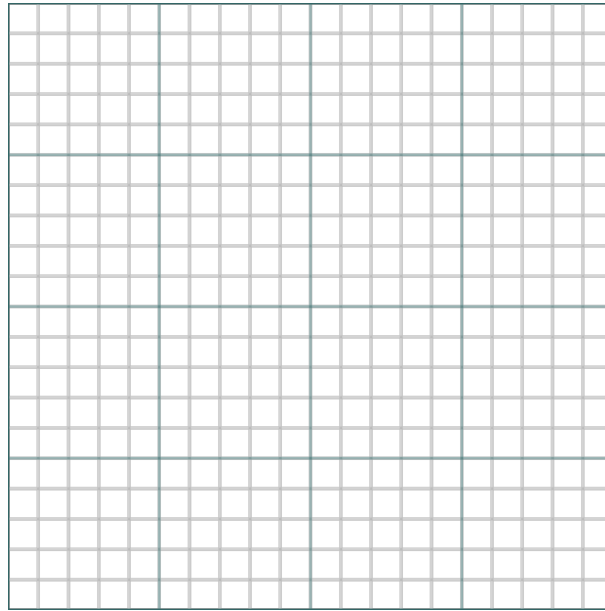
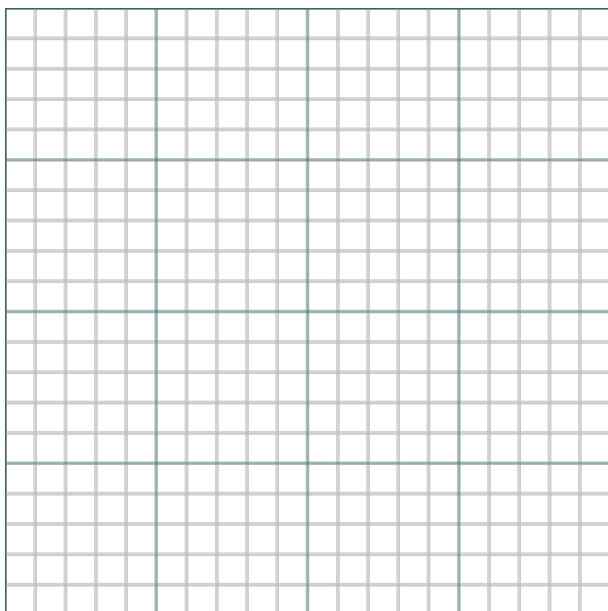
22. $f(x) = -2x + 5$

23. $3x - 4y = 20$

24. $2x + 3y = 15$

25. $x + 3y = 18$

26. $5y - 2x = -20$



Write the *canonical* slope-intercept form of the following lines

27. $m = \frac{2}{9}$, y -intercept $(0, 4)$

28. $m = -\frac{3}{8}$, y -intercept $(0, 5)$

29. $m = -4$, y -intercept $(0, -7)$

30. $m = \frac{2}{7}$, y -intercept $(0, -6)$

31. $m = -4.2$, y -intercept $(0, \frac{3}{4})$

32. $m = -4$, y -intercept $(0, -\frac{3}{2})$

33. $m = \frac{2}{9}$, passes through $(3, 7)$

34. $m = -\frac{3}{8}$, passes through $(5, 6)$

35. $m = 3$, passes through $(1, -2)$

36. $m = -2$, passes through $(-5, 1)$

37. $m = -\frac{3}{5}$, passes through $(-4, -1)$

38. $m = \frac{2}{3}$, passes through $(-4, -5)$

39. Passes through $(-1, 5)$ and $(2, -4)$

40. Passes through $(2, -1)$ and $(7, -11)$

41. Passes through $(7, 0)$ and $(-1, 4)$

42. Passes through $(-3, 7)$ and $(-1, -5)$

43. Passes through $(0, -6)$ and $(3, -4)$

44. Passes through $(-5, 0)$ and $(0, \frac{4}{5})$

Write the slope-intercept equation for a line passing through the given point and perpendicular to the given line. Plot things out.

57. $(3, 5)$, $y = \frac{2}{7}x + 1$

58. $(-1, 6)$, $f(x) = 2x + 9$

59. $(-7, 0)$, $y = -0.3x + 4.3$

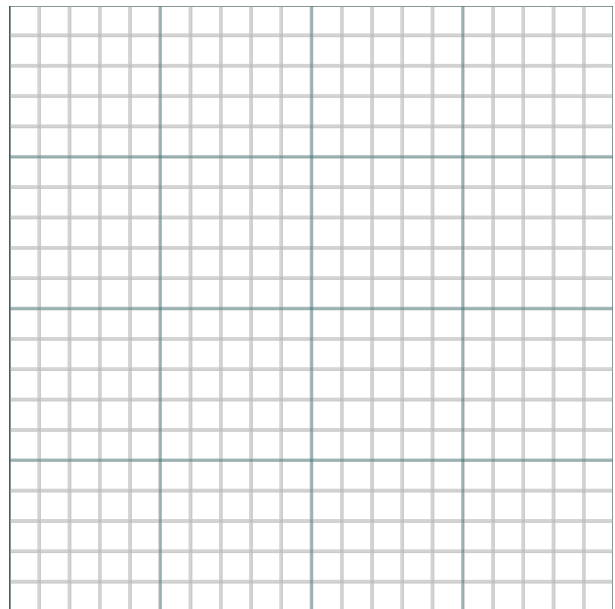
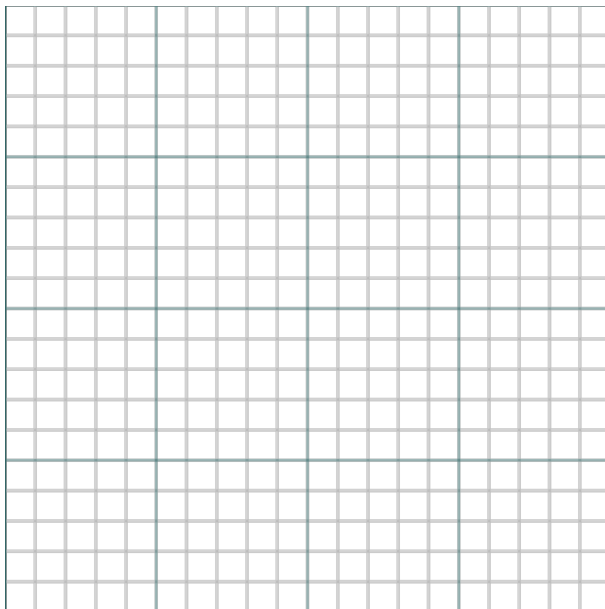
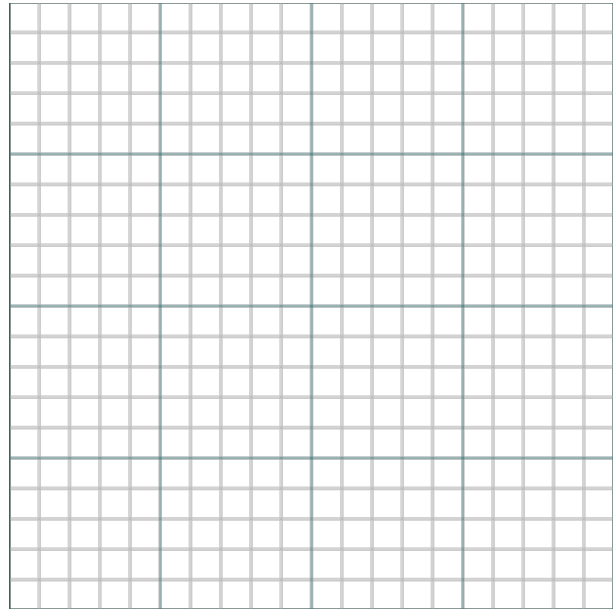
60. $(-4, -5)$, $2x + y = -4$

61. $(3, -2)$, $3x + 4y = 5$

62. $(8, -2)$, $y = 4.2(x - 3) + 1$

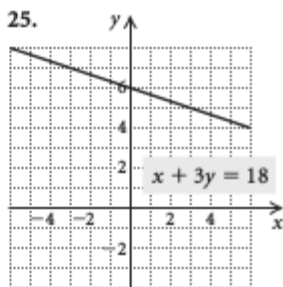
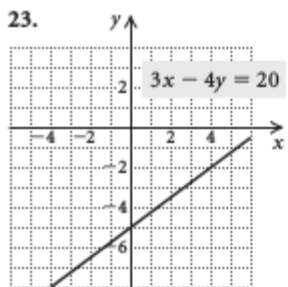
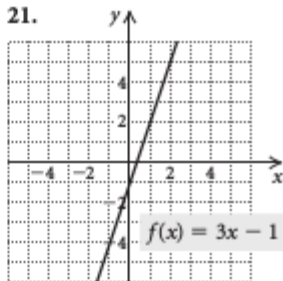
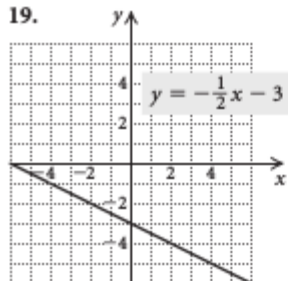
63. $(3, -3)$, $x = -1$

64. $(4, -5)$, $y = -1$



Exercise Set 1.4

1. $\frac{3}{5}$; $(0, -7)$ 3. Slope is not defined; there is no y -intercept.
 5. $-\frac{1}{2}$; $(0, 5)$ 7. $-\frac{3}{2}$; $(0, 5)$ 9. 0; $(0, -6)$
 11. $\frac{4}{5}$; $(0, \frac{8}{5})$ 13. 4; $(0, -2)$; $y = 4x - 2$
 15. -1 , $(0, 0)$; $y = -x$ 17. 0, $(0, -3)$; $y = -3$



27. $y = \frac{2}{9}x + 4$ 29. $y = -4x - 7$ 31. $y = -4.2x + \frac{3}{4}$
 33. $y = \frac{2}{9}x + \frac{19}{3}$ 35. $y = 3x - 5$ 37. $y = -\frac{3}{5}x - \frac{17}{5}$
 39. $y = -3x + 2$ 41. $y = -\frac{1}{2}x + \frac{7}{2}$ 43. $y = \frac{2}{3}x - 6$
 45. Horizontal: $y = -3$; vertical: $x = 0$
 47. Horizontal: $y = -1$; vertical: $x = \frac{2}{11}$ 49. Perpendicular
 51. Neither parallel nor perpendicular 53. Parallel
 55. Perpendicular 57. $y = \frac{2}{7}x + \frac{29}{7}$; $y = -\frac{7}{2}x + \frac{31}{2}$
 59. $y = -0.3x - 2.1$; $y = \frac{10}{3}x + \frac{70}{3}$
 61. $y = -\frac{3}{4}x + \frac{1}{4}$; $y = \frac{4}{3}x - 6$ 63. $x = 3$; $y = -3$
 65. True 67. True 69. False 71. No 73. Yes
 75. (a) Model I, using $(0, 7.8)$ and $(20, 6.4)$:
 $y = -0.07x + 7.8$; model II, using $(10, 7.3)$ and $(32, 4.9)$:
 $y = -\frac{6}{55}x + \frac{923}{110}$; (b) model I: about 5.2 days; model II: about 4.4 days; (c) model II 77. Using $(1, 10,424)$ and $(3, 11,717)$: