Section 1.1

29. The line $\ell : 3x + 2y = 13$ can be expressed in slope–intercept form as $y = -3x/2 + 13/2$, which shows that the slope of ℓ is $-3/2$. The line through $(-4, 6)$ parallel to ℓ also has slope $-3/2$ and thus has slope–intercept form $y = -3x/2 + b$ for some b. Since the point $(-4, 6)$ lies on this parallel line we have $6 = -3(-4)/2 + b = 6 + b$ which implies $b = 0$. Hence the equation of the parallel line is $y = -3x/2$.

32. The line $\ell : 2x - 3y = 5$ can be expressed in slope–intercept form as $y = 2x/3 - 5/3$, which shows that the slope of ℓ is $2/3$. The line through $(-2, 6)$ perpendicular to ℓ also has slope $-3/2$ and thus has slope–intercept form $y = -3x/2 + b$ for some b. Since the point $(-2, 6)$ lies on this perpendicular line we have $6 = -3(-2)/2 + b = 3 + b$ which implies $b = 3$. Hence the equation of the perpendicular line is $y = -3x/2 + 3$.

36. The slope of the line through $(4, -1)$ and $(k, 2)$ is

$$m = \frac{2 - (-1)}{k - 4} = \frac{3}{k - 4}$$

(a) The line $\ell : 2x + 3y = 6$ can be expressed in slope–intercept form as $y = -2x/3 + 2$, which shows that the slope of ℓ is $-2/3$. If the line through $(4, -1)$ and $(k, 2)$ is parallel to ℓ then

$$-\frac{2}{3} = m = \frac{3}{k - 4} \Rightarrow -2k + 8 = 9 \Rightarrow k = -\frac{1}{2}$$

(b) The line $\ell : 5x - 2y = -1$ can be expressed in slope–intercept form as $y = 5x/2 + 1/2$, which shows that the slope of ℓ is $5/2$. If the line through $(4, -1)$ and $(k, 2)$ is perpendicular to ℓ then

$$-\frac{2}{5} = m = \frac{3}{k - 4} \Rightarrow -2k + 8 = 15 \Rightarrow k = -\frac{7}{2}$$

78. Note that 1912 corresponds to $t = 12$ and 2007 corresponds to $t = 107$. Hence the points $(t, y) = (12, 12.1)$ and $(t, y) = (107, 1.9)$ are two points on the graph of the linear function $y = mt + b$ that gives the area y of the ice in terms of time t.

(a) The slope of the line is $m = \dfrac{1.9 - 12.1}{107 - 12} \approx -0.107$. Hence, the point-slope equation of the line is $y - 12.1 = -0.107(t - 12)$ which can be written in slope–intercept form as $y = -0.107t + 13.384$.

(b) We solve $6 = -0.107t + 13.384$ for $t \approx 69$ or the year 1969.

(c) We solve $0 = -0.107t + 13.384$ for $t \approx 125$ or the year 2025.

Section 1.3

29. In order for $f(x)$ to be defined the expression under the radical must be equal to or greater than 0. That is

$$0 \leq x^2 - 4x - 5 = (x-5)(x+1)$$

which implies either one of the expressions $x - 5$ and $x + 1$ is 0 or that both are nonzero and they have the same sign. If one of the two expressions is 0 then we have $x = 5$ or $x = -1$. If both are negative then $x < 5$ and $x < -1$ which implies $x < -1$. So, all $x \leq -1$ belong to the domain. If both are positive then $x > 5$ and $x > -1$ which implies $x > 5$. So, all $x \geq 5$ belong to the domain. Hence the domain of f is $(-\infty, -1] \cup [5, +\infty)$.

37. See the textbook's answers.

54. (a) $f(x+h) = -4(x+h)^2 + 3(x+h) + 2 = -4x^2 - 8hx + 3x - 4h^2 + 3h + 2$

(b) $f(x+h) - f(x) = -8hx - 4h^2 + 3h$

(c) $[f(x+h) - f(x)]/h = -8x - 4h + 3$

66. (a) $f(g(1)) = f(5) = \dfrac{1}{17}$ (b) $g(f(1)) = g(1/5) = 21/25$

(c) $(f \circ g)(x) = f(g(x)) = \dfrac{1}{3(x^2+4x)+2} = \dfrac{1}{3x^2+12x+2}$

(d)

$$\begin{aligned}(g \circ f)(x) = g(f(x)) &= \left(\frac{1}{3x+2}\right)^2 + 4\left(\frac{1}{3x+2}\right) = \frac{1}{(3x+2)^2} + \frac{4}{3x+2} = \frac{12x+9}{(3x+2)^2} \\ &= \frac{12x+9}{9x^2+12x+4}\end{aligned}$$

Section 1.4

7. C

35. Shift the graph of $y = \sqrt{x}$ two units to the right and two units up.

49. (a) Solve $0.5 = S(x) = 1 - 0.058x - 0.076x^2$ for $x \approx 2.21$ decades or 22.1 years. That is, the median age is $65 + 22.1 = 87.1$ years.

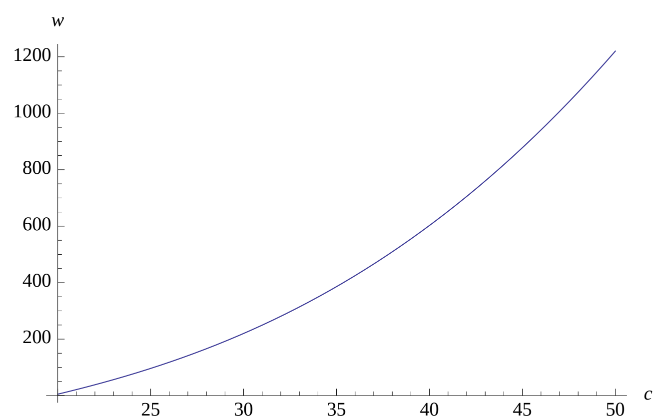
(b) Solve $0 = S(x) = 1 - 0.058x - 0.076x^2$ for $x \approx 3.27$ decades or 32.7 years. That is, few people live beyond $65 + 32.7 = 97.7$ years.

Section 1.5

49. Let $w(c) = \dfrac{c^3}{100} - \dfrac{1500}{c}$ for $0 < c$.

(a) $w(30) = 220$, $w(40) = 602.5$, and $w(50) = 1220$.

(b) $w(c) < 0 \Leftrightarrow \dfrac{c^3}{100} - \dfrac{1500}{c} < 0 \Leftrightarrow \dfrac{c^3}{100} < \dfrac{1500}{c} \Leftrightarrow c^4 < 150,000 \Leftrightarrow c < \sqrt[4]{150,000}$
Since $\sqrt[4]{150,000} \approx 19.68$, the formula should not be used for c values smaller than (approximately) 19.68.



$$w = \frac{c^3}{100} - \frac{1500}{c}$$

(c)

(d) Using the solve feature of the TI-89 on the equation $700 = \dfrac{c^3}{100} - \dfrac{1500}{c}$ yields $c \approx 41.9$.