Review Exercises for Chapter 1

Solutions to Even-Numbered Exercises

2. (a) Not a function. u is assigned 2 different values.

(b) Function (c) Function

(d) Not a function. w is assigned 2 different values and u is unassigned.

4. Yes, $y = 2x - 3$.

6. No, does not pass vertical line test.

8. $g(x) = x^{4/3}$

(a) $g(8) = 8^{4/3} = 2^4 = 16$

(b) $g(t + 1) = (t + 1)^{4/3}$

(c) $\dfrac{g(8) - g(1)}{8 - 1} = \dfrac{16 - 1}{8 - 1} = \dfrac{15}{7}$

(d) $g(-x) = (-x)^{4/3} = x^{4/3}$

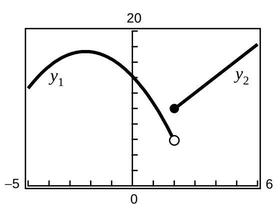
10. $(-\infty, \infty)$

12. $x^2 + 8x = x(x + 8) \geq 0$

Domain: $(-\infty, -8] \cup [0, \infty)$

14. $f(x) = \dfrac{2}{3x + 4}$. $3x + 4 \neq 0$. Domain: all $x \neq -\dfrac{4}{3}$

16. $B(t) = \begin{cases} -0.631x^2 - 2.845x + 14.160 & -5 \leq x < 2 \\ 2.088x + 5.768 & 2 \leq x \leq 6 \end{cases}$



For 1985, $x = -5$ and $B(-5) = 12.61$ billion dollars

For 1990, $x = 0$ and $B(0) = 14.16$ billion dollars

For 1995, $x = 5$ and $B(5) = 16.2$ billion dollars

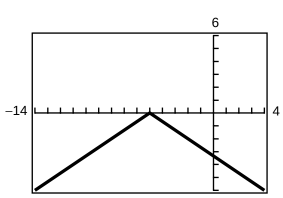
18. Domain: $2x^2 - 1 \geq 0 \Rightarrow x^2 \geq \dfrac{1}{2} \Rightarrow \left(-\infty, -\dfrac{\sqrt{2}}{2}\right] \cup \left[\dfrac{\sqrt{2}}{2}, \infty\right)$

Range: $[0, \infty)$

20. Domain: all real numbers

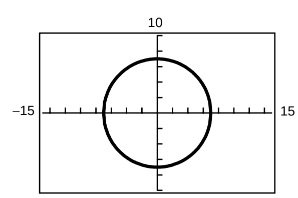
Range: $[0, \infty)$

22. (a)



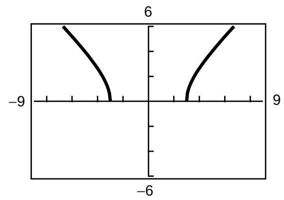
(b) y is a function of x.

24. (a)



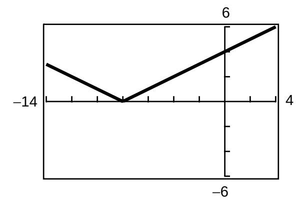
(b) y is not a function of x.

26. $f(x) = \sqrt{x^2 - 9}$



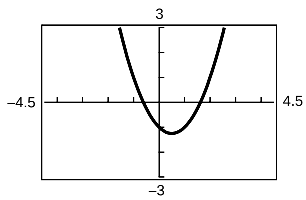
Increasing on $(3, \infty)$. Decreasing on $(-\infty, -3)$

28. $f(x) = \dfrac{|x + 8|}{2}$



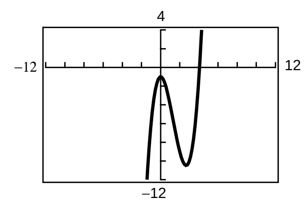
Increasing on $(-8, \infty)$. Decreasing on $(-\infty, -8)$

30. $f(x) = x^2 - x - 1$



Relative minimum: $(0.5, -1.25)$

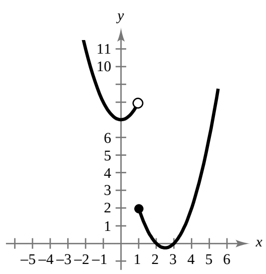
32. $f(x) = x^3 - 4x^2 - 1$



Relative maximum: $(0, -1)$

Relative minimum: $(2.67, -10.48)$

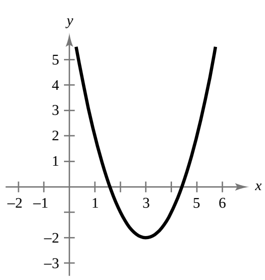
34. $f(x) = \begin{cases} x^2 + 7 & x < 1 \\ x^2 - 5x + 6 & x \geq 1 \end{cases}$



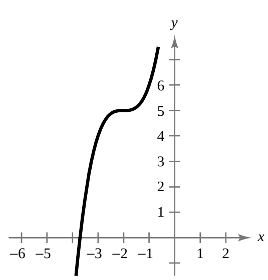
36. $f(x) = 2x^3 - x^2$ is neither even nor odd.

38. $g(x) = -x^3 - 2$ is obtained from $f(x) = x^3$ by a reflection in the y-axis, followed by a vertical shift 2 units downward. $g(x) = -f(x) - 2$.

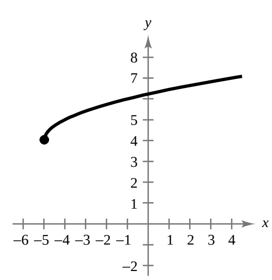
40.



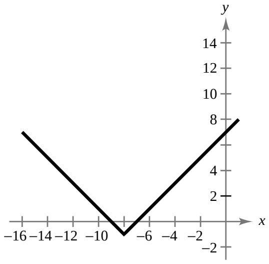
42.



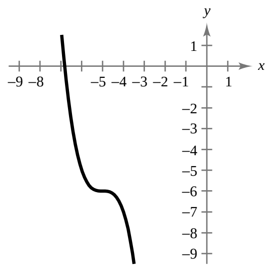
44.



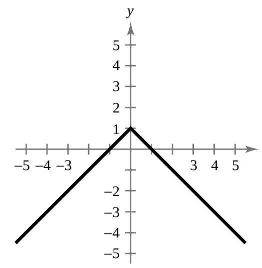
46.



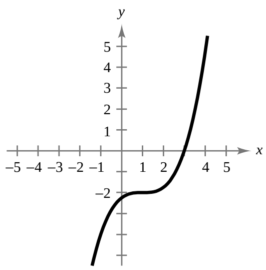
48.



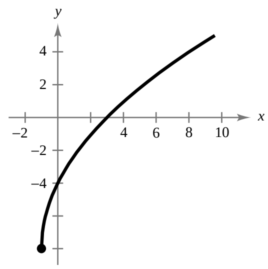
50.



52.



54.

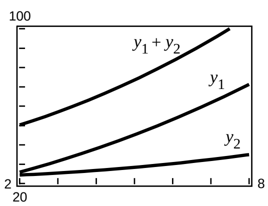


56. $(f + h)(5) = f(5) + h(5)$
$= -7 + 77$
$= 70$

58. $\left(\dfrac{g}{h}\right)(1) = \dfrac{g(1)}{h(1)} = \dfrac{1}{5}$

60. $(g \circ f)(-2) = g(7) = \sqrt{7}$

62.



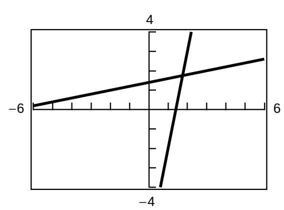
For 2002, $t = 12$, $y_1 \approx 116.6$, $y_2 \approx 47.9$ and $y_1 + y_2 \approx 164.5$ billion dollars.

64. $f^{-1}(x) = 12x$

66. $f^{-1}(x) = x - 5$

68. (a)
$$y = 5x - 7$$
$$x = 5y - 7$$
$$x + 7 = 5y$$
$$f^{-1}(x) = \frac{x + 7}{5}$$

(b)

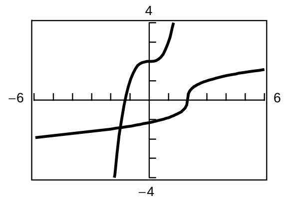


(c) $f^{-1}(f(x)) = f^{-1}(5x - 7)$
$$= \frac{5x - 7 + 7}{5}$$
$$= x$$
$$f(f^{-1}(x)) = f\left(\frac{x + 7}{5}\right)$$
$$= 5\left(\frac{x + 7}{5}\right) - 7$$
$$= x$$

70. (a)

$$y = x^3 + 2$$
$$x = y^3 + 2$$
$$x - 2 = y^3$$
$$f^{-1}(x) = \sqrt[3]{x - 2}$$

(b)



(c)

$$f^{-1}(f(x)) = f^{-1}(x^3 + 2) = \sqrt[3]{x^3 + 2 - 2} = x$$

$$f(f^{-1}(x)) = f\left(\sqrt[3]{x - 2}\right) = (x - 2) + 2 = x$$

72. $f(x) = \dfrac{7x + 3}{8}$

$$y = \frac{1}{8}(7x + 3)$$
$$x = \frac{1}{8}(7y + 3)$$
$$8x = 7y + 3$$
$$8x - 3 = 7y$$
$$f^{-1}(x) = \frac{1}{7}(8x - 3)$$

74. $f(x) = x^3 - 2$

$$y = x^3 - 2$$
$$x = y^3 - 2$$
$$x + 2 = y^3$$
$$f^{-1}(x) = \sqrt[3]{x + 2}$$

76. $f(x) = 4\sqrt{6 - x},\ x \le 6, y \ge 0$

$$y = 4\sqrt{6 - x}$$
$$x = 4\sqrt{6 - y},\ y \le 6, x \ge 0$$
$$x^2 = 16(6 - y) = 96 - 16y$$
$$16y = 96 - x^2$$
$$y = \frac{96 - x^2}{16}$$
$$f^{-1}(x) = \frac{96 - x^2}{16},\ x \ge 0$$

78. False. $f(x) = \frac{1}{x}$ or $f(x) = x$ satisfy $f = f^{-1}$.