Answers to Even-Numbered Exercises

Exercises 0.2
4. $f(0) = 0, f(2) = \frac{2}{3}$
10. $[-1, 1]
16. $(-\infty, \infty)$
20. $[0, \infty)$
28. It is the graph of a function since it passes the vertical line test.
34. It passes the horizontal line tests and so it is the graph of a one-to-one function.
44. $g(x) = \frac{1}{x} + 2, x \neq 0$. Its domain consists of all $x \neq 0$, and its range consists of all $y \neq 2$.

Exercises 0.3
6. It is decreasing on $(-2, -1)$ and $(0, 1)$, and increasing on $(-1, 0)$ and $(1, 2)$.
14. It is increasing on $(-\infty, 0)$, and it is decreasing on $(0, \infty)$.
18. $f$ is neither even nor odd.
22. $f$ is even and its graph is symmetric about the $y$-axis.
28. $y$-intercept is 3. There is no $x$-intercept.
36. (i) it matches (b).
   (ii) it matches (c).
   (iii) matches (a).
40. Translate the graph of $y = x^2$ to the left by 2 units and downward by 1 unit.

Exercises 0.4
6. slope -3, $y$-intercept 7
20. $x = -2$ (vertical)
22. $y = -\frac{1}{2}x + 4$
26. (a) \( C(x) = 450x + 2100 \)
\[ R(x) = 1050x \]
\[ P(x) = 600x - 2100 \]
(b) \( x = 3.5 \)
(c) \( P(9) = 3300 \)
(d) 5

34. supply curve is \( q = 160p - 120, \ p \geq 0.75 \)
demand curve is \( q = -150p + 600 \)
equilibrium point is \( q_e = \frac{7800}{31} \approx 251.61 \)

**Exercises 0.5**

2. Graph opens upward, vertex is (1,4), axis of symmetry is \( x = 1 \).

8. Graph opens upward, vertex is \( (-\frac{1}{3}, \frac{2}{3}) \), axis of symmetry is \( x = -\frac{1}{3} \).

10. \( f(x) = 2x^2 - x - 1 = (2x + 1)(x - 1) \).
\( f(x) \) will be positive on \((-\infty, -1/2)\) and \((1, \infty)\), and negative on \((-1/2, 1)\).

16. \( f(x) = x^2 - \frac{3}{4} = (x + \frac{\sqrt{3}}{2})(x - \frac{\sqrt{3}}{2}) \).
\( f(x) > 0 \) on \((-\infty, -\frac{\sqrt{3}}{2})\) and \((\frac{\sqrt{3}}{2}, \infty)\); \( f(x) < 0 \) on \((-\frac{\sqrt{3}}{2}, \frac{\sqrt{3}}{2})\).

22. (a) \( p = 60 - q/20, \ R(q) = 60q - \frac{q^2}{20}, \ P(x) = -\frac{q^2}{20} + 44q - 3000 \).
(b) break-even points: \( q = 440 \pm 20\sqrt{334} \approx 74.5 \) or 805.5.
(c) \( C(p) = 22000 - 320p \)
\( R(p) = 1200p - 20p^2 \)
\( P(p) = 22000 + 1520p - 20p^2 \)
break-even points are \( p = 38 \pm \sqrt{334} \approx 19.72 \) and 56.28
(d) A profit will be made if the price is between $19.72 and $56.28.

26. (a) \( t = \frac{3 + \sqrt{23}}{2} \approx 3.9 \)
(b) \( t = 3/2 \)
(c) 92

**Exercises 0.6**

2. \( f(x) \) falls to the left and right

8. \( a_n < 0, \) \( n \) is even

10. \( f(x) \) has vertical asymptote \( x = 1 \)
As \( x \) approaches 1, \( f(x) \) climbs from the right, and falls from the left.
20. \( f(x) \) has vertical asymptotes \( x = 0 \) and \( x = 4 \)
As \( x \) approaches 0, \( f(x) \) climbs from the left, and falls from the right.
As \( x \) approaches 4, \( f(x) \) climbs from the right, and falls from the left.

26. 0.2

30. 2

36. \( f(9) = 27 \)

42. Natural domain is \((0, \infty)\).
Decreasing on \((0, \infty)\) (i.e. everywhere).
Positive on \((0, \infty)\).
Vertical asymptote \( x = 0 \), climbs from the right.