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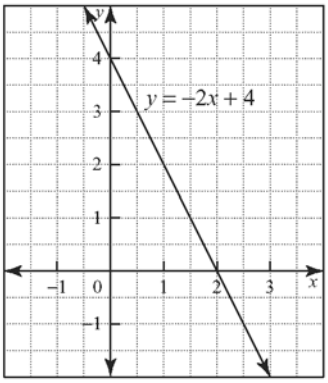
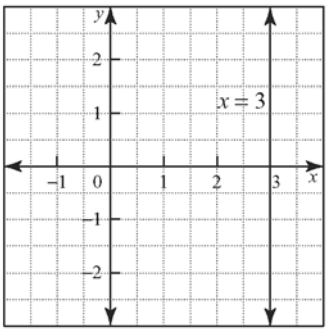
Chapter 1 Answers

Prerequisite Skills

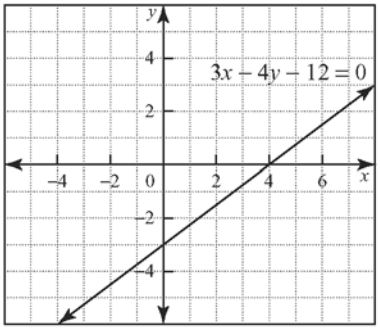
1. a)



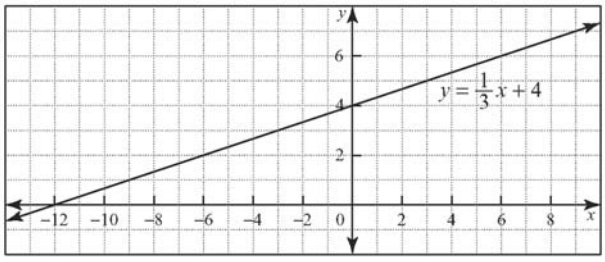
b)



c)



d)



2. $y = -\frac{1}{4}x + 2$

3. a) $y = \frac{1}{2}x - 5$ **b)** $y = 3x - 7$ **c)** $y = -\frac{2}{3}x + 1$

4. a) (3, 4) **b)** (–2, 2)

5. a) (–1, 3) **b)** (6, –5)

6. a) $6x^2 + 5x - 4$ **b)** $4t^2 - 12t + 9$

c) $5n^2 + 5n - 60$ **d)** $9x^2 - 21x - \frac{15}{4}$

7. a) $(x - 1)^2$ **b)** $(x - 4)(x + 5)$

c) $3(x - 1)(x + 2)$ **d)** $-2(2x - 1)(2x + 3)$

8. a) no **b)** $(2n - 1)^2$ **c)** $(x + 4)^2$

d) no

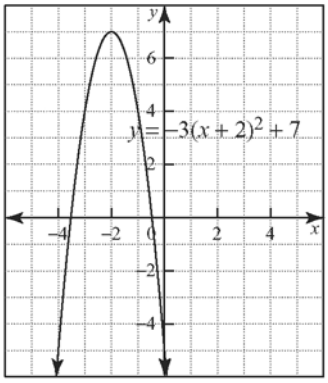
9. a) $k = 4$ **b)** $k = 36$ **c)** $k = \frac{1}{4}$

d) $k = \frac{25}{4}$

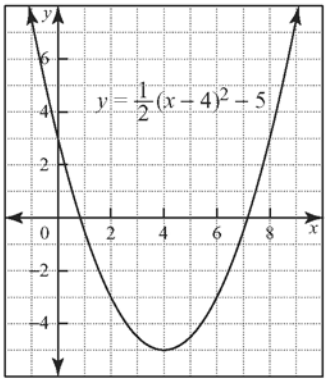
10. a) $-\frac{2}{3}(x^2 - \frac{9}{2}x)$ **b)** $\frac{1}{4}(x^2 - 5x)$

c) $\frac{3}{4}(x^2 + 16x)$ **d)** $-\frac{3}{5}(x^2 - \frac{20}{3}x)$

11. a) i) (–2, 7) **ii)** $x = -2$ **iii)** downward **iv)** (0, –5)



b) i) (4, –5) **ii)** $x = 4$ **iii)** upward **iv)** (0, 3)



12. $y = x^2 - 2x - 3$

13. a) $y = (x - 1)^2 + 3$; vertex (1, 3)

b) $y = 3(x + 3)^2 - 11$; vertex (–3, –11)

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14. a) i) Answers may vary. Sample answer: The second is shifted 2 units to the left of the first, due to the difference in the values of h (one being 1 and the other being −1, which differ by 2).

ii) Answers may vary. Sample answer: The second is shifted 4 units down from the first, due to the difference in the values of k (one being 2 and the other being −2, which differ by 4).

b) verified using a graphing calculator

1.1 Functions, Domain, and Range

1. a) domain $\{x \in \mathbb{R}, x \geq 1\}$; range $\{y \in \mathbb{R}\}$

b) domain $\{x \in \mathbb{R}, x \neq 1\}$; range $\{y \in \mathbb{R}, y \neq 0\}$

2. a) domain $\{x \in \mathbb{R}\}$; range $\{y \in \mathbb{R}\}$

b) domain $\{x \in \mathbb{R}, x \neq 2\}$; range $\{y \in \mathbb{R}, y \neq 0\}$

c) domain $\{x \in \mathbb{R}\}$; range $\{y \in \mathbb{R}, y \geq 4\}$

d) domain $\{x \in \mathbb{R}, x \geq -5\}$; range $\{y \in \mathbb{R}, y \geq 0\}$

3. length = 150 m; width = 75 m

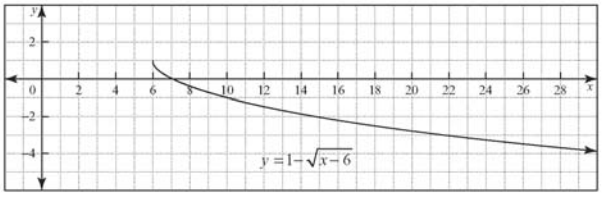
4. a) range {13, 10, 7, 4, 1, −2, −5}

b) range {23, 13, 7, 5, 7, 13, 23}

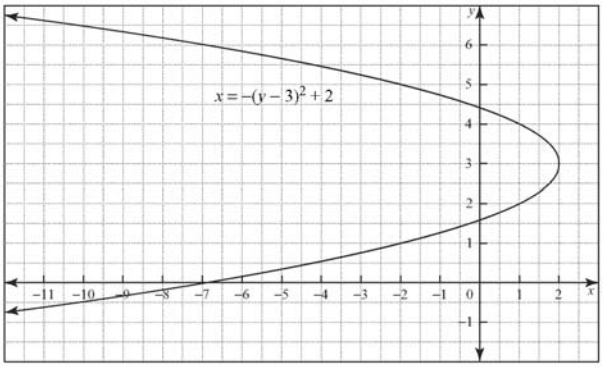
c) range $\left\{-\frac{1}{7}, -\frac{1}{6}, -\frac{1}{5}, -\frac{1}{4}, -\frac{1}{3}, -\frac{1}{2}, -1\right\}$

d) range {−24, −9, −4, −9, −24, −49, −84}

5. a) Answers may vary. Sample answer:



b) Answers may vary. Sample answer:

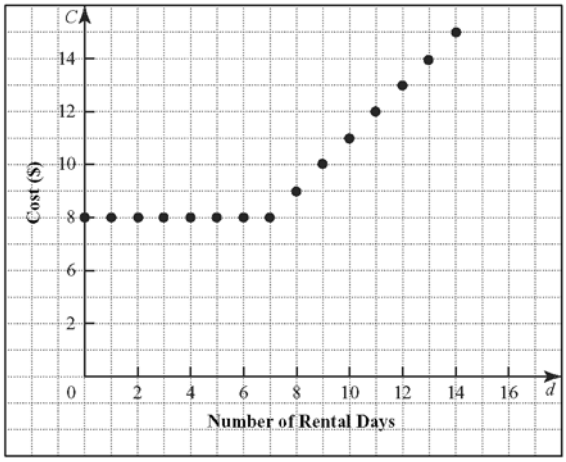


6. Answers may vary. Sample answer: This statement can be true, with the correct relation and function. For example, the function $y = x + 2$ has a domain and range that are all real numbers, and the relation $x = y^3 + y^2 - y$ also has a domain and range that are all real numbers.

7. a) $C = 8$

b) $C = d + 1$

c)



d) Answers may vary. Sample answer: Any rental period is measured in full days only, and the cost of any rental is always a whole dollar amount.

1.2 Functions and Function Notation

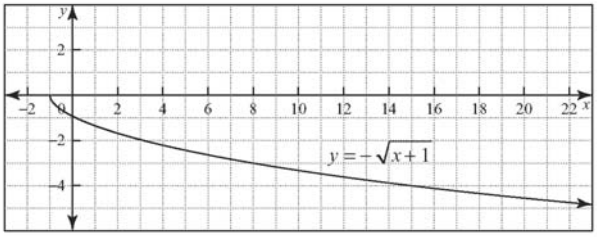
1. Answers may vary.

2. a) $f : x \to 3x^2 - 8$ **b)** $C : v \to 2v - 11$

c) $h : t \to -5t^2 + 2t + 3$ **d)** $p : r \to \frac{3r}{2r + 1}$

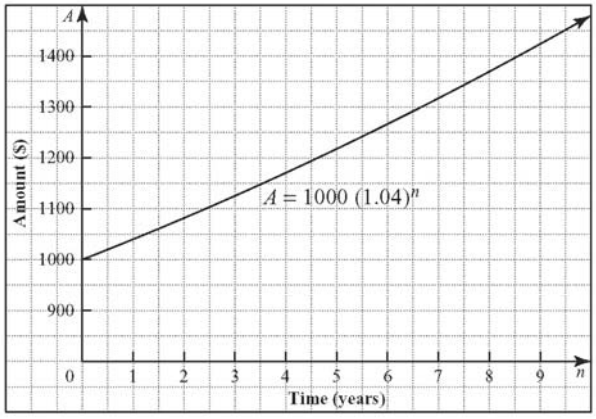
3. a)

x	y
−1	0
0	−1
3	−2
8	−3
15	−4



b) Answers may vary. Sample answer: Yes, because the relation passes the vertical line test.

4. a)



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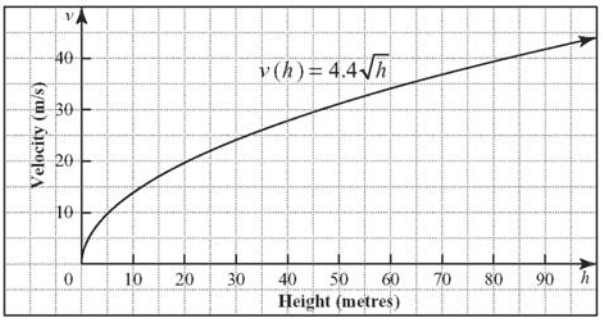
b) Answers may vary. Sample answer: Yes, as there is a unique value for the amount for each year of the investment.

5. a) domain $\{h \in \mathbb{R}, h \geq 0\}$; range $\{v \in \mathbb{R}, v \geq 0\}$

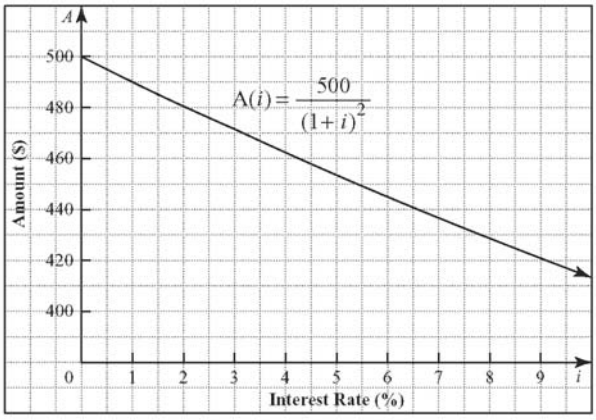
b)



c) Yes, because the graph passes the vertical line test.

6. Rayanna is incorrect because a function does not need to pass a horizontal line test, only a vertical line test.

7. a)



b) $457.86 **c)** 15.5%

8. a) $a = 3$ and $c = -5$

b) Answers may vary. Sample answer: (2, 7) and (–1, –2)

c) No, as a value of $y = 22$ is associated with $x = 3$.

1.3 Maximum or Minimum of a Quadratic Function

1. a) $55 **b)** 36 cars **c)** $1980

2. $2.75

3. a) (–2, –20) **b)** (–1.25, –2.125)

c) (–1, 3.5) **d)** (–3, –11)

4. a) 45 m **b)** 3.2 s **c)** 45.2 m

5. 6 and 6

6. 75 cm

7. a) 7 amps **b)** 24.5 W

8. a) 50 **b)** $99 000 000

1.4 Skills You Need: Working With Radicals

1. a) $8\sqrt{3}$ **b)** $2\sqrt{2} - 13\sqrt{3}$

c) $27\sqrt{3} - 6$ **d)** $\sqrt{2} - 2\sqrt{3}$

2. a) 21 **b)** $60\sqrt{3} - 8\pi$

3. Answers may vary. Sample answer: Yes, as they both satisfy the equation when substituted.

4. perimeter $20 + 8\sqrt{14}$ cm; area $40\sqrt{14}$ cm^2

5. Answers may vary. Sample answer: Factor the number 588 by finding the largest perfect square factor of the number. This perfect square number can then be removed from the root by evaluating its square root. All other factors that are not perfect squares would remain under the root sign.

6. $3\sqrt{7}$ cm

7. 9

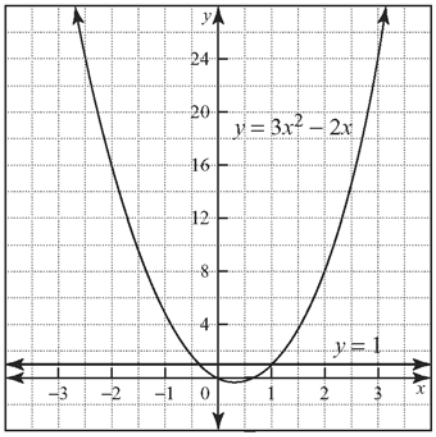
1.5 Solving Quadratic Equations

1. a) $x = 0$ and $x = 4$ **b)** $x = 1$ and $x = -3$

c) $x = \frac{1}{3}$ and $x = -2$ **d)** $x = \frac{11 \pm \sqrt{249}}{8}$

2. a) $k = 4$ **b)** $k > 4$

3. a) and **b)**



c) $x = 1$ and $x = -\frac{1}{3}$ **d)** verified algebraically

4. a) $k = 1, -1, -5, 5$ **b)** $k = -3, 0, 3$

c) $k = -3$ **d)** $k = 13, -13$

5. length 9.2 cm; width 5.2 cm

6. 3 cm

7. 0.5 m

8. 3.7 cm

1.6 Determine a Quadratic Equation Given Its Roots

1. a) $y = -\frac{1}{2}(x - 3)(x + 4)$ **b)** $y = 2(x - 2)(x + 2)$

c) $y = -\frac{3}{2}(x - 5)(x - 11)$ **d)** $y = 3(x + 5)(x + 11)$

2. a) $h = -\frac{1}{50}x(x - 60)$ **b)** 17.5 m

3. a) $y = 2x^2 + 12x - 14$ **b)** $y = -3x^2 + 3x + 60$

4. Answers may vary. Sample answer: Plot the indicated points, and then graph the equation. The results are verified if the parabola passes through the three points.

5. a) yes **b)** $y = 5(x - 5)^2$

6. a) (–10, 0), (10, 0) **b)** (0, 20) **c)** $y = -\frac{1}{5}x^2 + 20$

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7. $y = -\frac{1}{280}x(x - 280); y = -\frac{1}{280}x^2 + x$

1.7 Solve Linear-Quadratic Systems

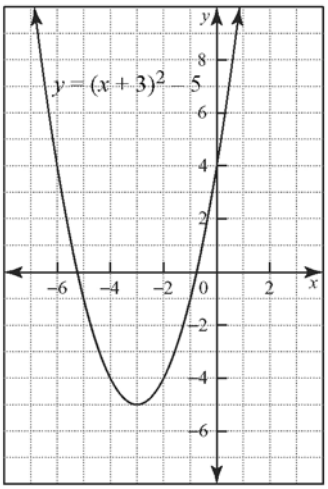
1. a) (2, –3) and (–5, 25) **b)** (1, –1) and (–7, –25)
2. a) twice **b)** not at all
3. a) $b = -7$ **b)** $b = \frac{5}{4}$
4. Answers may vary. Sample answer: Graph both equations, and then use the graphing calculator to determine the points of intersection of the two functions.
5. approximately 41 items per day
6. a) $k > 15$ **b)** $k = 15$ **c)** $k < 15$
7. verified using a graphing calculator
8. Answers may vary. Sample answer: The tangent line must touch the curve at only one point in the local area of the tangent point of interest, and the tangent line must approximate the slope of the curve at the point of contact.

Chapter 1 Review

1. a) {1, 3, 5, 7, 9} **b)** $\{-2, -4, \text{undefined}, 4, 2\}$
c) $\{0, \pm\sqrt{2}, \pm\sqrt{3}\}$
2. a) domain $\{x \in \mathbb{R}, x \geq 1\}$; range $\{y \in \mathbb{R}\}$
b) domain $\{x \in \mathbb{R}, x \geq 3\}$; range $\{y \in \mathbb{R}, y \geq 0\}$
c) domain $\{x \in \mathbb{R}\}$; range $\{y \in \mathbb{R}, y \leq 4\}$
3. 1a), 1b), 2b), and 2c) are functions.
4. a)

x	y
–6	4
–5	–1
–4	–4
–3	–5
–2	–4
–1	–1
0	4

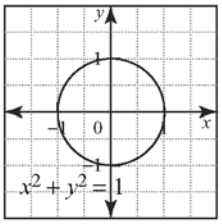
b)



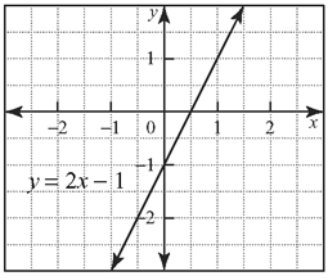
5. a) domain $\{x \in \mathbb{R}, x > -2\}$; range $\{y \in \mathbb{R}, y > 0\}$
b) Division by zero is undefined.
c) a vertical asymptote
6. a) a maximum at (2, 15) **b)** a minimum at (6, –3)
c) a minimum at (–1.4, 8.4)
d) a maximum at $\left(-\frac{11}{4}, \frac{129}{8}\right)$
7. a) 250 km/h **b)** 375 L/h **c)** 2550 L
8. a) $27 - 6\sqrt{6}$ **b)** $7\sqrt{5} + 10$
c) 2 **d)** $3\sqrt{2} - 4\sqrt{3} + 3$
9. $36\sqrt{2} + 12$ cm^2
10. a) $x = -5$ and $x = \frac{2}{3}$ **b)** $x = \frac{-6 \pm 2\sqrt{51}}{-3}$
c) $x = \frac{-2 \pm \sqrt{14}}{2}$
11. $k = \pm 3, \pm 9$
12. a) 5 s **b)** 2.5 s **c)** 31.25 m
13. Answers may vary. Sample answer: He is correct, since the y-intercept is found by setting $x = 0$ and solving, which means only the value of c would remain. This means that the y-value of the y-intercept is given by the value of c.
14. $y = 3x^2 - 6x - 6$
15. (1, 1) and (–4, 11)
16. $b = -14$
17. verified using a graphing calculator

Chapter 1 Practice Test

1. C **2.** A **3.** B **4.** B **5.** C
6. a) Answers may vary. Sample answer:



b) Answers may vary. Sample answer



7. a) domain $\{x \in \mathbb{R}\}$; range $\{y \in \mathbb{R}, y \leq 5\}$
b) domain $\{-1, 0, 1, 2, 3, 4\}$; range $\{10, 13, 14, 13, 10, 5\}$

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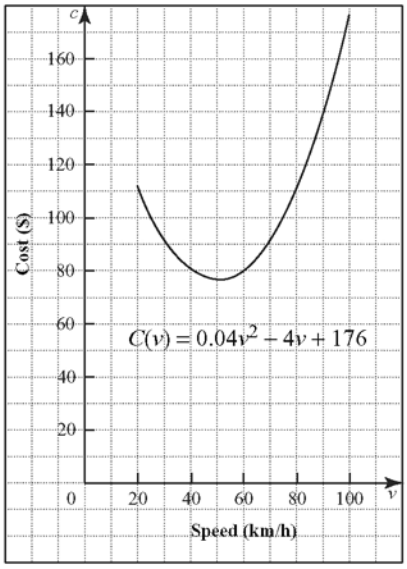
8. a) (3, –1) **b)** maximum
c) Answers may vary. Sample answer: Since the vertex is located below the x-axis and the parabola opens downward, there are no x-intercepts.

9. a)



b) 50 km/h **c)** $76

10. a) $15.50 **b)** $4805.00

11. 4 and –4

12. a) $x = \dfrac{9 \pm \sqrt{89}}{4}$ **b)** $x = \dfrac{-2 \pm \sqrt{10}}{-3}$

13. $y = -2(x - 3)(x - 7)$ and $y = -2x^2 + 20x - 42$

14. a) $x^2 - 2$ **b)** $20 - 12\sqrt{2} + 16\sqrt{5}$ **c)** $5\sqrt{2} + 25$

15. $\dfrac{17\sqrt{2}}{2}$

16. a) $x = 7$ and $x = -2$ **b)** $x = \dfrac{-11 \pm \sqrt{101}}{10}$

17. 20 m

18. $y = -2x^2 + 12x + 32$

19. $y = \dfrac{3}{25}x^2 - 3$

20. (1, –7) and (–4, –17)

21. $b = -7$

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