Chapter 1 Even Solutions

Section 1.1

2. B is a function of A. The domain is 10, 10.5, 13, 15, 16, 20}. The range is {3, 4, 9, 13, 23}.

4. B is a function of A. The domain is {2, 4, 6, 8, 10, 12}. The range is {3}.

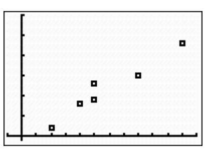
6. $f(2) = 9$; if $f(x) = 2$, then x is 0 or 1.

8. $f(2) = 2$; if $f(x) = 2$, then x is −4, −1, 0, 2, 10 or 17.

10. (a) Cost is a function of age because each age is associated with only one cost.
(b) Age is not a function of cost because costs $45 and $90 are associated with more than one age.

12. (a) For the given height, BMI is a function of weight in pounds because each weight input has only one BMI output.
(b) For the given height, weight in pounds is a function of BMI because each BMI input has only one weight output.

Section 1.2

2.  B is not a function of A because the input 5 has two output values; two points lie on the same vertical line.

4. The graph does not represent a function because the input 4 has 6 different output values.

6. The graph represents a function each input value has only one output value. The domain is [−4, 4], and the range is [0, 16].

8. $f(2) = -1$; if $f(x) = 2$, then x is 0 or 3.

10. $f(2) = 1$; there is no value of x for which $f(x) = 2$.

12. Length of growing season is a function of latitude, because each latitude has only one length of growing season.

14. (a) The domain (in years) is [0, 25].
(b) The range (in thousands of dollars) is [1.8, 43.4].

(c) The price of a 10-year-old Corvette is about $15 thousand.
(d) A Corvette that costs 10 thousand dollars is about 12 years old.

16. (a) The domain (in calendar years) is [1985, 2003].
(b) The range (in millions of cases) is approximately [200, 380].
(c) 250 million cases were sold in 2001 or 2002.
(d) In 1994 about 310 million cases were sold.

Section 1.3

2. The independent variable is *u*; the dependent variable is *T*. In function notation we have $T(u) = 4u - 7$.

4. The independent variable is *e*; the dependent variable is *V*. In function notation we have $V(e) = e^3$.

6. *y* is a function of *x* because number of hamburgers has only one cost.

8. *y* is a function of *x* because each real number *x* has only one square.

10. *y* is a function of *x* because each real number *x* is associated with only one value of *y*.

12. $f(-1) = (-1)^2 + 1 = 2;$
$f(0.5) = (0.5)^2 + 1 = 1.25;$
$f(\sqrt{2}) = (\sqrt{2})^2 + 1 = 3.$

14. $f(-1) = \sqrt{(-1)^2 + 2} = \sqrt{3};$
$f(0.5) = \sqrt{(0.5)^2 + 2} = 1.5;$
$f(\sqrt{2}) = \sqrt{\left(\sqrt{2}\right)^2 + 2} = 2.$

16. $\sqrt{5x+4} = 13 \rightarrow 5x+4 = 169 \rightarrow 5x = 165 \rightarrow x = 33.$

18. Both the domain and the range of *h*(*x*) are the set of real numbers.

20. The domain is the set of real numbers; the range is [7, ∞].

22. (a) $E(d) = 0.820150d$
(b) $E(475) = 0.820150 \cdot 475 = 389.571$ Euros.
(c) $0.820150d = 492.09 \rightarrow d = 600$ dollars.
(d) Domain = Range = [0, ∞].

24. (a) Postage rate is a function of weight because each weight is associated with only one postage rate.
(b) Both 6.9 and 7 ounces letters cost \$0.37 + 6·\$0.23 = \$1.75. A 7.1-ounce letter costs an additional \$0.23, or \$1.98.
(c) \$1.06 − \$0.37 = \$0.69, so the letter weighs up to 3 "additional" ounces. The letter weighs over 3 ounces, but not more than 4 ounces.
(d)

$$R(w) = \begin{cases} \$0.37 \text{ if } 0 < w \le 1 \\ \$0.60 \text{ if } 1 < w \le 2 \\ \$0.83 \text{ if } 2 < w \le 3 \\ \$1.06 \text{ if } 3 < w \le 4 \\ \$1.29 \text{ if } 4 < w \le 5 \\ \$1.52 \text{ if } 5 < w \le 6 \\ \$1.75 \text{ if } 6 < w \le 7 \\ \$1.98 \text{ if } 7 < w \le 8 \\ \$2.21 \text{ if } 8 < w \le 9 \\ \$2.44 \text{ if } 9 < w \le 10 \\ \$2.67 \text{ if } 10 < w \le 11 \\ \$2.90 \text{ if } 11 < w \le 12 \\ \$3.13 \text{ if } 12 < w \le 13 \end{cases}$$

(e) The domain (in ounces) is (0, 13]; the range (in dollars) is {0.37, 0.60, 0.83, 1.06, 1.29, 1.52, 1.75, 1.98, 2.21, 2.44, 2.67, 2.90, 3.13}.

Section 1.4

2. The function is increasing on [−6, 5]; the function is not decreasing.

4. The function is increasing on [0, 4], and decreasing on [4, 8].

6.

x	$f(x)$	$\frac{\Delta f}{\Delta x}$
0	25	1
5	30	0.8
10	34	−0.2
15	33	−0.2
20	32	--

The average rate of change is decreasing on [0, 10] and constant on [10, 20].

8.

x	$f(x)$	$\frac{\Delta f}{\Delta x}$
−1	18	−3
0	15	−1.5
4	9	−1.286 *
11	0	−1
23	−12	--

*correct to 3 decimal places
The average rate of change is decreasing on [−1, 23].

10. The function is on increasing [1995, 1999] and [2001, 2003]; the function is constant on [1993, 1995] and [1999, 2001].

12. The average rate of change is shown in the table below.

Year	*Number*	$\frac{\Delta Number}{\Delta Year}$
1997	878	43
1998	921	58
1999	979	125
2000	1104	109
2001	1213	91
2002	1304	45
2003	1349	7
2004	1356	--

(a) The number of new cases is increasing at an increasing on [1997, 2000].
(d) The number of new cases is increasing at a decreasing on [2000, 2004].