Answers to Odd-Numbered Exercises and Tests

Chapter P

Section P.1 (page 9)

Vocabulary Check (page 9)

1. rational **2.** Irrational **3.** absolute value
4. composite **5.** prime **6.** variables, constants
7. terms **8.** coefficient **9.** Zero-Factor Property

1. (a) 5, 1 (b) 5, 0, 1 (c) $-9, 5, 0, 1, -4, -1$
(d) $-9, -\frac{7}{2}, 5, \frac{2}{3}, 0, 1, -4, -1$ (e) $\sqrt{2}$

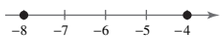
3. (a) 1, 20 (b) 1, 20 (c) $-13, 1, -10, 20$
(d) $2.01, 0.666\ldots, -13, 1, -10, 20$
(e) 0.010110111 . . .

5. (a) $\frac{6}{3}$, 3 (b) $\frac{6}{3}$, 3 (c) $\frac{6}{3}, -2, 3, -3$
(d) $-\frac{1}{3}, \frac{6}{3}, -7.5, -2, 3, -3$ (e) $-\pi, \frac{1}{2}\sqrt{2}$

7. 0.3125 **9.** $0.\overline{123}$ **11.** $-9.\overline{09}$ **13.** $\frac{23}{5}$

15. $-\frac{13}{2}$ **17.** $-1 < 2.5$

19.

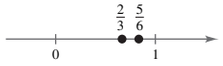


$-4 > -8$

21.

$\frac{3}{2} < 7$

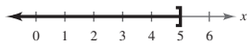
23.



$\frac{5}{6} > \frac{2}{3}$

25. (a) $x \leq 5$ is the set of all real numbers less than or equal to 5.

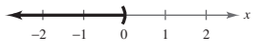
(b)



(c) Unbounded

27. (a) $x < 0$ is the set of all negative real numbers.

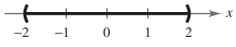
(b)



(c) Unbounded

29. (a) $-2 < x < 2$ is the set of all real numbers greater than -2 and less than 2.

(b)



(c) Bounded

31. (a) $-1 \leq x < 0$ is the set of all negative real numbers greater than or equal to -1.

(b)

(c) Bounded

33. $x < 0; (-\infty, 0)$ **35.** $y \geq 0; [0, \infty)$

37. $-1 \leq p < 9; [-1, 9)$

39. $[-1, 5]$ **41.** $[-3, 10)$ **43.** $[-a, a + 4]$

45. The set of all real numbers greater than -6

47. The set of all real numbers less than or equal to 2

49. 10 **51.** -9

53. 1 for $x > -2$; undefined for $x = -2$; -1 for $x < -2$

55. 1 **57.** 0 **59.** $\frac{7}{2}$ **61.** $|-3| > -|-3|$

63. $-5 = -|5|$ **65.** $-|-2| = -|2|$

67. 51 **69.** $\frac{5}{2}$ **71.** $\frac{128}{75}$ **73.** $|x - 5| \leq 3$

75. $|y - 0| \geq 6$ **77.** 179 miles

79. $|\$113{,}356 - \$112{,}700| = \$656 > \$500$

$0.05(\$112{,}700) = \$5635$

Because the actual expenses differ from the budget by more than \$500, there is failure to meet the "budget variance test."

81. $|\$37{,}335 - \$37{,}640| = \$305 < \$500$

$0.05(\$37{,}640) = \$1882$

Because the difference between the actual expenses and the budget is less than \$500 and less than 5% of the budgeted amount, there is compliance with the "budget variance test."

83. Receipts = \$1351.8 billion

|Receipts − Expenditures| = \$164 billion

There was a deficit of \$164 billion.

85. Receipts = \$1827.5 billion

|Receipts − Expenditures| = \$125.6 billion

There was a surplus of \$125.6 billion.

87. Receipts = \$1782.3 billion

|Receipts − Expenditures| = \$375.3 billion

There was a deficit of \$375.3 billion.

89. Terms: $7x$, 4; coefficient: 7

91. Terms: $\sqrt{3}x^2, -8x, -11$; coefficients: $\sqrt{3}, -8$

93. Terms: $4x^3, \frac{x}{2}, -5$; coefficients: $4, \frac{1}{2}$

95. (a) 1 (b) -6 **97.** (a) 0 (b) 0

99. Commutative Property of Addition

101. Multiplicative Inverse Property

103. Distributive Property

105. Associative Property of Addition

107. $\frac{1}{2}$ **109.** $\frac{3}{8}$ **111.** $\frac{11x}{12}$ **113.** $\frac{96}{x}$ **115.** $-\frac{7}{5}$

117. -36.00 **119.** 1.56 **121.** 13.33

123. (a)

n	1	0.5	0.01	0.0001	0.000001
$5/n$	5	10	500	50,000	5,000,000

(b) $5/n$ approaches ∞ as n approaches 0.

125. False. A contradiction can be shown using the numbers $a = 2$ and $b = 1$. $2 > 1$, but $\frac{1}{2} \not> \frac{1}{1}$.

127. (a) $-A$ is negative. (b) $B - A$ is negative.

129. (a) No. If u is negative while v is positive, or vice versa, the expressions will not be equal.

(b) $|u + v| \leq |u| + |v|$

131. Answers will vary. Sample answer: Natural numbers are the integers from 1 to infinity. Whole numbers are integers from 0 to infinity. A rational number can be expressed as the ratio of two integers; an irrational number cannot.

Section P.2 (page 21)

Vocabulary Check (page 21)

1. exponent, base **2.** scientific notation
3. square root **4.** principal nth root
5. index, radicand **6.** simplest form
7. conjugates **8.** rationalizing **9.** power, index

1. (a) 48 (b) 81 **3.** (a) 729 (b) -9
5. (a) 243 (b) $-\frac{3}{4}$ **7.** (a) $\frac{5}{6}$ (b) 4 **9.** $\frac{7}{4}$
11. -54 **13.** 1 **15.** (a) $-125z^3$ (b) $5x^6$
17. (a) $\frac{7}{x}$ (b) $\frac{4}{3}(x + y)^2,\ x + y \neq 0$
19. (a) $\frac{x^2}{y^2},\ x \neq 0$ (b) $\frac{b^5}{a^5},\ b \neq 0$
21. -1600 **23.** 2.125 **25.** 8.5225×10^2
27. 1.0252484×10^4 **29.** -1.11025×10^3
31. 2.485×10^{-4} **33.** -2.5×10^{-6} **35.** 125,000
37. $-481{,}600{,}000$ **39.** 0.0000000325
41. -0.009001 **43.** 5.73×10^7 **45.** 8.99×10^{-5}
47. 571,000,000 **49.** 0.00000000000000000016022
51. 5×10^4 or 50,000 **53.** (a) 4.907×10^{17} (b) 1.479
55. (a) 67,082.039 (b) 39.791 **57.** 11 **59.** 3
61. -125 **63.** $\frac{1}{8}$ **65.** -4 **67.** -7.225
69. 21.316 **71.** 14.499 **73.** 2.035 **75.** 2.709
77. 1,010,000.128 **79.** (a) 3 (b) $2x\sqrt[5]{3}$
81. (a) $3y^2\sqrt{6x}$ (b) $2\sqrt[3]{4a^2/b^2}$
83. (a) $34\sqrt{2}$ (b) $22\sqrt{2}$
85. (a) $13\sqrt{x + 1}$ (b) $18\sqrt{5x}$
87. $\sqrt{5} + \sqrt{3} > \sqrt{5 + 3}$ **89.** $5 > \sqrt{3^2 + 2^2}$
91. $\frac{\sqrt{3}}{3}$ **93.** $\frac{\sqrt{14} + 2}{2}$ **95.** $\frac{2}{\sqrt{2}}$
97. $\frac{2}{3(\sqrt{5} - \sqrt{3})}$ **99.** $64^{1/3}$ **101.** $\sqrt[5]{32}$
103. $(-216)^{1/3}$ **105.** $81^{3/4}$ **107.** $\frac{2}{x}$
109. $\frac{1}{x^3},\ x > 0$ **111.** (a) $\sqrt{3}$ (b) $\sqrt[3]{(x + 1)^2}$
113. (a) $2\sqrt[4]{2}$ (b) $\sqrt[8]{2x}$ **115.** 0.026 inch
117. $\frac{166}{11} \approx 15.09$ storms; rational number
119. True. $x^{k+1}/x = x^k x/x = x^k\ (x \neq 0)$.
121. $1 = \frac{a^n}{a^n} = a^{n-n} = a^0$
123. When any positive integer is squared, the units digit is 0, 1, 4, 5, 6, or 9. Therefore, $\sqrt{5233}$ is not an integer.

Section P.3 (page 32)

Vocabulary Check (page 32)

1. n, a_n **2.** zero polynomial **3.** monomial
4. First, Outer, Inner, Last **5.** prime
6. perfect square trinomial

1. d **2.** e **3.** b **4.** a **5.** f **6.** c
7. Answers will vary, but first term is $-2x^3$.
9. Answers will vary, but first term has the form $-ax^4$, $a > 0$.
11. $4x^2 + 3x + 2$
Degree: 2; leading coefficient: 4
13. $-x^6 + 5$
Degree: 6; leading coefficient: -1
15. $-2x^5 + 6x^4 - x + 1$
Degree: 5; leading coefficient: -2

17. Polynomial: $4x^3 + 3x - 5$ **19.** Not a polynomial

21. $-2x - 10$ **23.** $5t^3 - 5t + 1$

25. $8.1x^3 + 29.7x^2 + 11$ **27.** $3x^3 - 6x^2 + 3x$

29. $-15z^2 + 5z$ **31.** $-4x^4 + 4x$ **33.** $-7.5x^3 - 15x$

35. $-\frac{1}{4}x^2 - 6x$ **37.** $x^2 + 7x + 12$ **39.** $6x^2 - 7x - 5$

41. $4x^2 - 20xy + 25y^2$ **43.** $x^2 - 100$ **45.** $x^2 - 4y^2$

47. $4r^4 - 25$ **49.** $x^3 + 3x^2 + 3x + 1$

51. $8x^3 - 12x^2y + 6xy^2 - y^3$ **53.** $\frac{1}{4}x^2 - 5x + 25$

55. $\frac{1}{16}x^2 - 9$ **57.** $5.76x^2 + 14.4x + 9$

59. $-3x^4 - x^3 - 12x^2 - 19x - 5$

61. $x^2 + 4xz + 4z^2 - 25$

63. $x^2 + 2xy + y^2 - 6y - 6x + 9$ **65.** $2x^2 + 2x$

67. $u^4 - 16$ **69.** $4(x + 4)$ **71.** $2x(x^2 - 3)$

73. $(x - 5)(3x + 8)$ **75.** $(x + 8)(x - 8)$

77. $3(4y + 3)(4y - 3)$ **79.** $\left(2x - \frac{1}{3}\right)\left(2x + \frac{1}{3}\right)$

81. $[(x - 1) - 2][(x - 1) + 2] = (x - 3)(x + 1)$

83. $(x - 2)^2$ **85.** $\left(x + \frac{1}{2}\right)^2$ **87.** $(2x - 3)^2$

89. $\left(2x - \frac{1}{3}\right)^2$ **91.** $(x + 4)(x^2 - 4x + 16)$

93. $(y + 6)(y^2 - 6y + 36)$ **95.** $\left(x - \frac{2}{3}\right)\left(x^2 + \frac{2}{3}x + \frac{4}{9}\right)$

97. $(2x - 1)(4x^2 + 2x + 1)$

99. $(x + 2 - y)(x^2 + 4x + 4 + xy + 2y + y^2)$

101. $(x - 1)(x + 2)$ **103.** $(s - 2)(s - 3)$

105. $-(y - 4)(y + 5)$ **107.** $(3x - 2)(x - 1)$

109. $(2x + 1)(x - 1)$ **111.** $(5x + 1)(x + 5)$

113. $-(5u - 2)(u + 3)$ **115.** $(x - 1)(x^2 + 2)$

117. $(3x + 2)(2x - 1)$ **119.** $(x^2 + 1)(x - 5)$

121. $x(x + 4)(x - 4)$ **123.** $x^2(x - 1)$ **125.** $(x - 1)^2$

127. $(2x - 1)^2$ **129.** $-2x(x - 2)(x + 1)$

131. $(9x + 1)(x + 1)$ **133.** $\frac{1}{96}(3x + 2)(4x - 3)$

135. $(3x + 1)(x^2 + 5)$ **137.** $(u + 2)(3 - u^2)$

139. $(x - 2)(x + 2)(2x + 1)$ **141.** $(x + 1)^2(x - 1)^2$

143. $2(t - 2)(t^2 + 2t + 4)$ **145.** $2(2x - 1)(4x - 1)$

147. $-(x + 1)(x - 3)(x + 9)$

149. $2(2x + 1)^3(3x - 1)(18x - 1)$

151. $2(x^2 + 5)^3(15x^2 - 4x + 15)(3x - 1)$

153. (a) $500r^2 + 1000r + 500$

(b)

r	$2\frac{1}{2}\%$	3%	4%
$500(1 + r)^2$	525.31	530.45	540.80

r	$4\frac{1}{2}\%$	5%
$500(1 + r)^2$	546.01	551.25

(c) The amount increases with increasing r.

155. $V = x(15 - 2x)\left(\frac{45 - 3x}{2}\right)$

$= \frac{3}{2}x(x - 15)(2x - 15)$

x (centimeters)	3	5	7
V (square centimeters)	486	375	84

157. (a) $T(x) = 0.0475x^2 + 1.099x + 0.23$

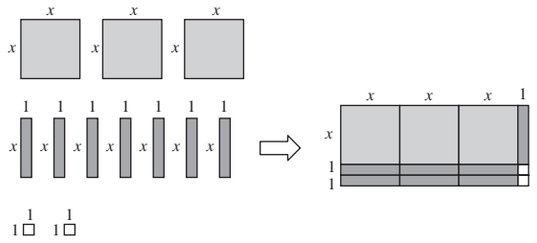
(b)

x (miles per hour)	30	40	55
T (feet)	75.95	120.19	204.36

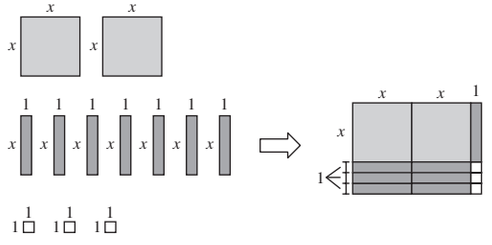
(c) Stopping distance increases as speed increases.

159. b **160.** c **161.** a **162.** d

163.



165.



167. $4\pi(r + 1)$ **169.** $4(6 - x)(6 + x)$

171. $(4x^3)(2x + 1)^3(2x^2 + 2x + 1)$

173. $(2x - 5)^3(5x - 4)^2(70x - 107)$

CHAPTER P

175. $\frac{-8}{(5x-1)^2}$ **177.** $-14,\ 14,\ -2,\ 2$

179. $-51, 51, -15, 15, -27, 27$

181. $2, -3$ **183.** $3, -8$

185. (a) $V = \pi h(R-r)(R+r)$

(b) $V = 2\pi\left[\left(\frac{R+r}{2}\right)(R-r)\right]h$

187. False. $(x^2-1)(x^2+1)$ becomes a fourth-degree polynomial.

189. False. Counterexample: $x^2 + 2^2 \neq (x+2)^2$ if $x = 3$.

191. n

193. Answers will vary. Sample answer: $(x-y)^2 \neq x^2 - y^2$ because to expand the binomial, use the FOIL Method, not just distribute the squares. After using the FOIL Method, $(x-y)^2 = x^2 - 2xy + y^2$, which is not equal to $x^2 - y^2$.

195. Answers will vary. Sample answer: To cube a binomial difference, cube the first term. Next subtract 3 times the square of the first term multiplied by the second term. Then add 3 times the first term multiplied by the square of the second term. Lastly, subtract the cube of the second term

$(x-y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$.

197. No. $(3x-6)(x+1)$ is not completely factored because 3 can be factored out of $(3x-6)$.

199. (a) Yes. The sum of two polynomials will have the same degree as the polynomial of greater degree unless the polynomials have equal degree and their leading coefficients are opposites.

(b) No. Same reasoning as in (a).

(c) No. Same reasoning as in (a).

Section P.4 (page 44)

Vocabulary Check (page 44)

1. domain **2.** rational expression

3. complex fractions **4.** smaller **5.** equivalent

1. All real numbers **3.** All nonnegative real numbers

5. All real numbers x except $x = 3$

7. All real numbers x except $x = 1$

9. All real numbers x except $x = 3$

11. All real numbers x such that $x \geq -7$

13. All real numbers x such that $x \geq \frac{5}{2}$

15. All real numbers x such that $x > 3$

17. $3x,\ x \neq 0$ **19.** $(x+1),\ x \neq -1$

21. $x+2,\ x \neq -2$ **23.** $\frac{3x}{2},\ x \neq 0$ **25.** $\frac{3y}{y+1},\ x \neq 0$

27. $-\frac{4y}{5},\ y \neq \frac{1}{2}$ **29.** $-\frac{1}{2},\ x \neq 5$

31. $y-4,\ y \neq -4$ **33.** $\frac{x(x+3)}{x-2},\ x \neq -2$

35. $\frac{y-4}{y+6},\ y \neq 3$ **37.** $-(x^2+1),\ x \neq 2$ **39.** $z-2$

41.

x	0	1	2	3	4	5	6
$\frac{x^2-2x-3}{x-3}$	1	2	3	Undef.	5	6	7
$x+1$	1	2	3	4	5	6	7

The expressions are equivalent except at $x = 3$.

43. Only common factors of the numerator and denominator can be canceled. In this case, factors of terms were incorrectly canceled.

45. $\frac{\pi}{4}$ **47.** $\frac{1}{5(x-2)},\ x \neq 1$ **49.** $\frac{r+1}{r},\ r \neq 1,\ -1$

51. $\frac{t-3}{(t+3)(t-2)},\ t \neq -2$ **53.** $\frac{3}{2},\ x \neq -y$

55. $\frac{x+5}{x-1}$ **57.** $-\frac{2x^2-5x-18}{(2x+1)(x+3)}$ **59.** $-\frac{2}{x-2}$

61. $-\frac{x^2+3}{(x+1)(x-2)(x-3)}$ **63.** $-\frac{x^2-2x+2}{x(x^2+1)}$

65. $\frac{1}{2},\ x \neq 2$ **67.** $x(x+1),\ x \neq -1, 0$

69. $-\frac{2x+h}{x^2(x+h)^2},\ h \neq 0$ **71.** $\frac{2x-1}{2x},\ x > 0$

73. $x^{-2}(x^7-2) = \frac{x^7-2}{x^2}$ **75.** $-\frac{1}{(x^2+1)^5}$

77. $\frac{2x^3-2x^2-5}{(x-1)^{1/2}}$ **79.** $\frac{2x^2-1}{x^{5/2}}$

81. $-\frac{(x-1)(x^2+x+2)}{x^2(x^2+1)^{3/2}}$ **83.** $\frac{-2(3x^2+3x-5)}{\sqrt{4x+3}(x^2+5)^2}$

85. $\frac{1}{\sqrt{x+2}+\sqrt{x}}$ **87.** $\frac{1}{\sqrt{x+2}+\sqrt{2}},\ x \neq 0$

89. $\frac{1}{\sqrt{x+9}+3}$ **91.** $\frac{x}{2(2x+1)}$

93. (a) $\frac{1}{16}$ minute (b) $\frac{x}{16}$ minute(s) (c) $\frac{60}{16} = \frac{15}{4}$ minutes

95. (a) $R_1 = \frac{R_1R_2R_3}{R_2R_3 + R_1R_3 + R_1R_2}$ (b) 2 ohms

97. (a)

Year	2000	2001	2002
Endangered	565	592	597
Threatened	139	144	146

Year	2003	2004	2005
Endangered	598	599	599
Threatened	147	147	147

Answers will vary.

Sample answer: The estimates are very close to the actual data. There were slight differences between the estimates and the actual data for 2002, 2003, and 2004. Because the differences were always smaller than 2 or 3, they did not alter the effectiveness of the model.

(b) $\frac{Threatened}{Endangered} = \frac{(243.48t^2 + 139)(3.91t^2 + 1)}{(1.65t^2 + 1)(2342.52t^2 + 565)}$

Year	2000	2001	2002	2003	2004	2005
Ratio	0.25	0.24	0.25	0.25	0.25	0.25

99. $2x + h, h \neq 0$

101. $\frac{-2x - h}{x^2(x + h)^2}, h \neq 0$ **103.** $\frac{1}{\sqrt{2x + h} + \sqrt{2x}}, h \neq 0$

105. $\frac{4n^2 + 6n + 26}{3}, n \neq 0$

107. False. The domain of the left-hand side is $x^n \neq 1$.

109. Completely factor the numerator and denominator to determine if they have any common factors.

111. Answers will vary. Counterexample: Let $x = y = 1$.
$\sqrt{1 + 1} = \sqrt{2} \neq \sqrt{1} + \sqrt{1}$

Section P.5 (page 55)

Vocabulary Check (page 55)

1. (a) iii (b) vi (c) i (d) iv (e) v (f) ii

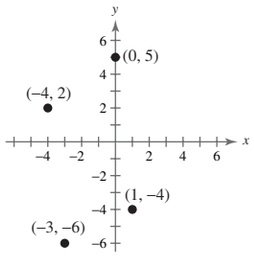
2. Cartesian **3.** Distance Formula

4. Midpoint Formula

5. $(x - h)^2 + (y - k)^2 = r^2$, center, radius

1. A: $(2, 6)$; B: $(-6, -2)$; C: $(4, -4)$; D: $(-3, 2)$

3.



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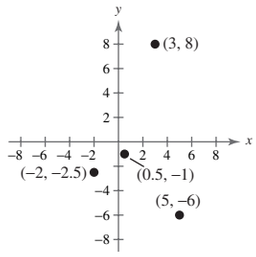
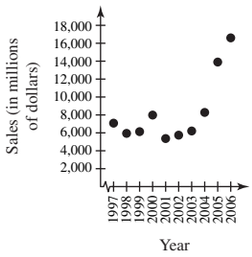


7. $(-5, 4)$ **9.** $(-6, -6)$ **11.** Quadrant IV

13. Quadrant II **15.** Quadrant III or IV

17. Quadrant III **19.** Quadrant I or III

21.



23. 8 **25.** 5 **27.** 13 **29.** $\frac{\sqrt{277}}{6}$

31. $\sqrt{71.78}$ **33.** (a) 4, 3, 5 (b) $4^2 + 3^2 = 5^2$

35. (a) 10, 3, $\sqrt{109}$ (b) $10^2 + 3^2 = \left(\sqrt{109}\right)^2$

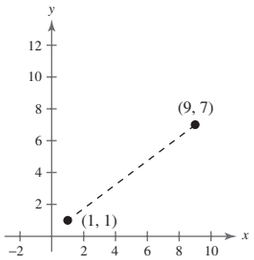
37. $\left(\sqrt{5}\right)^2 + \left(\sqrt{45}\right)^2 = \left(\sqrt{50}\right)^2$

39. Two equal sides of length $\sqrt{29}$.

41. Opposite sides have equal lengths of $2\sqrt{5}$ and $\sqrt{85}$.

43. The diagonals are of equal length $\left(\sqrt{58}\right)$. The slope of the line between $(-5, 6)$ and $(0, 8)$ is $\frac{2}{5}$. The slope of the line between $(-5, 6)$ and $(-3, 1)$ is $-\frac{5}{2}$. The slopes are negative reciprocals, making them perpendicular lines, which form a right angle.

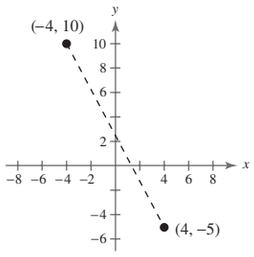
45. (a)



(b) 10

(c) (5, 4)

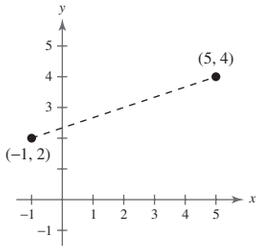
47. (a)



(b) 17

(c) $\left(0, \frac{5}{2}\right)$

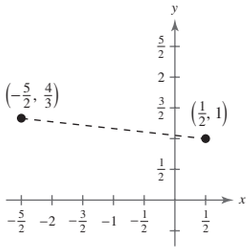
49. (a)



(b) $2\sqrt{10}$

(c) (2, 3)

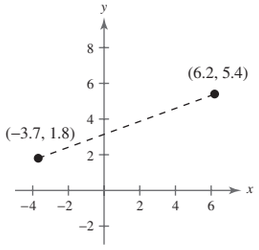
51. (a)



(b) $\frac{\sqrt{82}}{3}$

(c) $\left(-1, \frac{7}{6}\right)$

53. (a)



(b) $\sqrt{110.97}$

(c) (1.25, 3.6)

55. $3,093.5 million

57. $(2x_m - x_1, 2y_m - y_1)$;

(a) (7, 0)

(b) (9, −3)

59. $x^2 + y^2 = 9$ **61.** $(x - 2)^2 + (y + 1)^2 = 16$

63. $(x + 1)^2 + (y - 2)^2 = 5$

65. $(x - 3)^2 + (y - 4)^2 = 25$

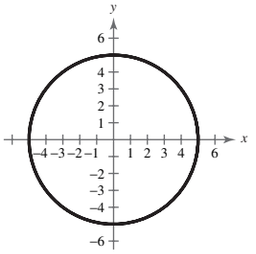
67. $(x + 2)^2 + (y - 1)^2 = 1$

69. $(x - 3)^2 + (y + 6)^2 = 16$

71. $(x - 2)^2 + (y + 1)^2 = 16$

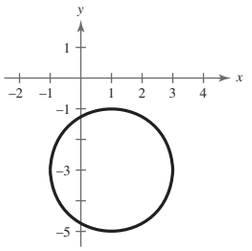
73. Center: (0, 0)

Radius = 5



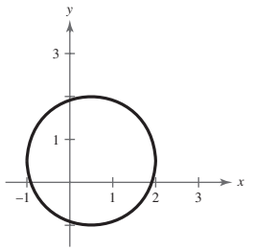
75. Center: (1, −3)

Radius = 2



77. Center: $\left(\frac{1}{2}, \frac{1}{2}\right)$

Radius = $\frac{3}{2}$



79. (0, 1), (4, 2), (1, 4)

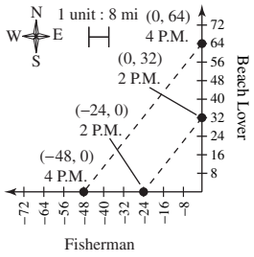
81. (−1, 5), (2, 8), (4, 5), (1, 2) **83.** 65

85. (a) Answers will vary. Sample answer: The number of artists elected each year seems to be nearly steady except for the first few years. Estimate: From 5 to 7 new members in 2007

(b) Answers will vary. Sample answer: The Rock and Roll Hall of Fame was opened in 1986.

87. $5\sqrt{74} \approx 43$ yards

89. (a)



(b) 2 P.M.: 40 miles; 4 P.M.: 80 miles; The yachts are twice as far from each other at 4 P.M. as they were at 2 P.M.

91. The distance between (2, 6) and $\left(2 + 2\sqrt{3}, 0\right)$ is $4\sqrt{3}$. The distance between $\left(2 + 2\sqrt{3}, 0\right)$ and $\left(2 - 2\sqrt{3}, 0\right)$ is $4\sqrt{3}$. The distance between (2, 6) and $\left(2 - 2\sqrt{3}, 0\right)$ is $4\sqrt{3}$. Because the distance between each set of points is $4\sqrt{3}$, the sides connecting those points are all the same length, making the coordinates the vertices of an equilateral triangle.

93. False. You would have to use the Midpoint Formula 15 times.

95. False. It could be a rhombus.

97. No. The scales depend on the magnitudes of the quantities measured.

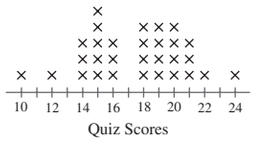
Section P.6 (page 64)

Vocabulary Check (page 64)

1. Statistics **2.** Line plots **3.** histogram
4. frequency distribution **5.** bar graph
6. Line graphs

1. (a) \$2.569 (b) 0.19

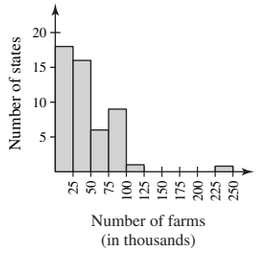
3.



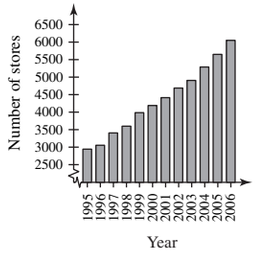
15

5. Sample answer:

Interval	*Tally*
[0, 25)	𝍸 𝍸 𝍸 |||
[25, 50)	𝍸 𝍸 𝍸 |
[50, 75)	𝍸 |
[75, 100)	𝍸 |||
[100, 125)	|
[125, 150)	
[150, 175)	
[175, 200)	
[200, 225)	
[225, 250)	|



7.



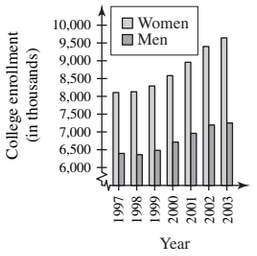
Answers will vary. Sample answer: As time progresses from 1995 to 2006, the number of Wal-mart stores increases at a fairly constant rate.

9.

Year	1999	2000	2001
Difference in tuition charges (in dollars)	10,998	11,575	12,438

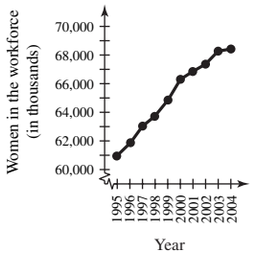
Year	2002	2003	2004
Difference in tuition charges (in dollars)	13,042	13,480	14,129

11.

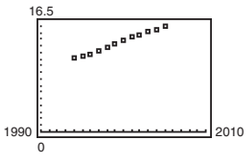


13. ≈ 118% **15.** \$2.59; January

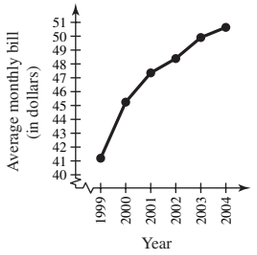
17. Answers will vary. Sample answer: As time progresses from 1995 to 2004, the number of women in the workforce increases at a fairly constant rate.



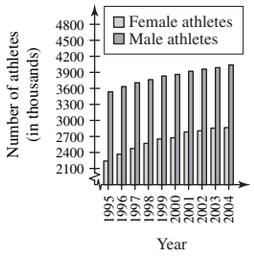
19.



21. Answers will vary. Sample answer: A line graph is best because the data are amounts that increased or decreased from year to year.



23. Answers will vary. Sample answer: A double bar graph is best because there are two different sets of data within the same time interval that do not deal primarily with increasing or decreasing behavior.



25. Line plots are useful for ordering small sets.

Histograms or bar graphs can be used to organize larger sets.

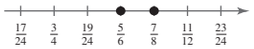
Line graphs are used to show trends over periods of time.

Review Exercises (page 69)

1. (a) 11 (b) 11 (c) $11, -14$

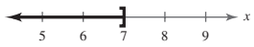
(d) $11, -14, -\frac{8}{9}, \frac{5}{2}, 0.4$ (e) $\sqrt{6}$

3. (a) $0.8\overline{3}$ (b) 0.875



$\frac{5}{6} < \frac{7}{8}$

5. The set consists of all real numbers less than or equal to 7.



7. $[-2, -1)$ **9.** 122 **11.** $|x - 7| \geq 6$

13. $|y + 30| < 5$ **15.** (a) -11 (b) 25

17. (a) -18 (b) -12

19. Associative Property of Addition

21. Commutative Property of Addition **23.** $\frac{14}{9}$ **25.** $\frac{1}{24}$

27. $\frac{47x}{60}$ **29.** (a) $-8z^3$ (b) $3a^3b^2$

31. (a) $\frac{3u^5}{v^4}$ (b) m^{-2} **33.** 2.585×10^9

35. 1.25×10^{-7} **37.** 5.1×10^9 **39.** 128,000

41. 0.000018 **43.** 483,600,000 **45.** 78

47. $5|a|$ **49.** $\frac{3}{4}$ **51.** $\frac{x}{3}\sqrt[3]{2}$ **53.** $\sqrt{3}$

55. $3\sqrt{3x}$ **57.** $\sqrt{2x}(2x + 1)$

59. 288 square inches. Square, because the width and height are equal.

61. $\frac{3 + \sqrt{5}}{4}$ **63.** $\frac{5}{2\sqrt{5}}$ **65.** 32,768 **67.** $6x^{9/10}$

69. $-2x^5 - x^4 + 3x^3 + 15x^2 + 5$; degree: 5; leading coefficient: -2

71. $-3x^2 - 7x + 1$ **73.** $2x^3 - x^2 + 3x - 9$

75. $a^5 + a^4 - 3a^3 + 2a^2 + 2a - 6$

77. $y^6 + y^4 - y^3 - y$

79. $x^2 - 64$ **81.** $x^3 - 12x^2 + 48x - 64$

83. $m^2 - 8m - n^2 + 16$

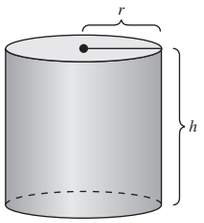
85. $(x + 3)(x + 5) = 5(x + 3) + x(x + 3)$

Distributive Property

87. $7(x + 5)$ **89.** $x(x^2 - 1) = x(x - 1)(x + 1)$

91. $2x(x^2 + 9x - 2)$

93. (a)



$2\pi r^2$ = area of top and bottom

$2\pi rh$ = surface area of lateral face

(b) $S = 2\pi r(r + h)$

95. $(x - 13)(x + 13)$ **97.** $(x + 6)(x^2 - 6x + 36)$

99. $(x - 9)(x + 3)$ **101.** $(2x + 1)(x + 10)$

103. $(x - 4)(x^2 - 3)$ **105.** $(x - 3)(2x + 5)$

107. All real numbers

109. All real numbers x except $x = \frac{3}{2}$

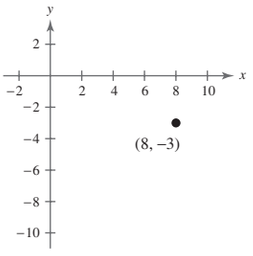
111. $\frac{x}{x^2 + 7}$, $x \neq 0$ **113.** $\frac{x - 6}{x - 5}$, $x \neq -5$

115. $\frac{1}{x^2}$, $x \neq \pm 2$ **117.** $\frac{1}{5}x(5x - 6)$, $x \neq 0, -\frac{3}{2}$

119. $\frac{x^3 - x + 3}{(x - 1)(x + 2)}$ **121.** $\frac{x + 1}{x(x^2 + 1)}$

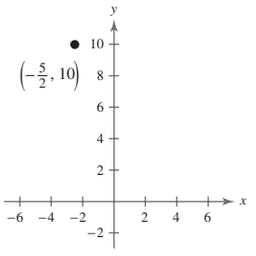
123. $-\frac{1}{xy(x + y)}$, $x \neq y$

125.



Quadrant IV

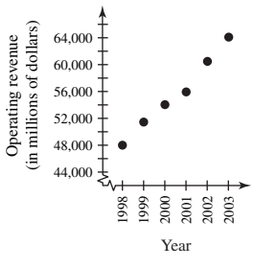
127.



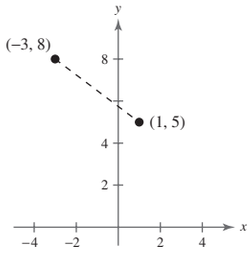
Quadrant II

129. Quadrant IV

131.

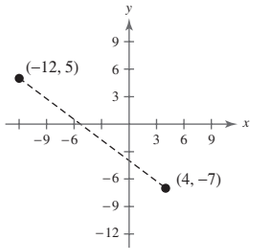


133.



Distance = 5

135.

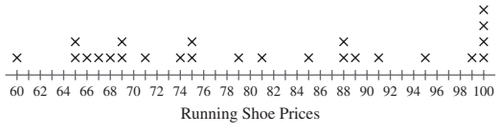


Midpoint: $(-4, -1)$

137. $(x - 3)^2 + (y + 1)^2 = 68$

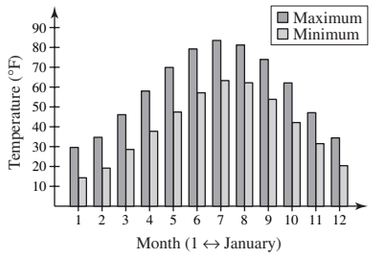
139. (2, 5), (4, 5), (2, 0), (4, 0)

141.



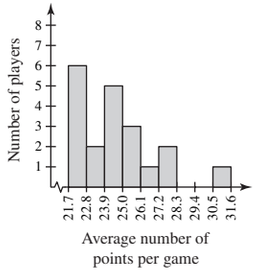
The price with the greatest frequency is \$100.

143.



145. Answers will vary. Sample answer: A histogram is the best method for organizing the data because the data consists of average numbers of points, and not how many points each player scored or whether the scores were increasing or decreasing.

Interval	*Tally*
[21.7, 22.8)	𝍸 |
[22.8, 23.9)	||
[23.9, 25)	𝍸
[25, 26.1)	|||
[26.1, 27.2)	|
[27.2, 28.3)	||
[28.3, 29.4)	
[29.4, 30.5)	
[30.5, 31.6)	|



147. False. $\dfrac{x^3 - 1}{x - 1}$ is undefined at $x = 1$.

149. You must raise 2 to the fourth power as well.

$(2x)^4 = 2^4x^4 = 16x^4$

151. Radicals cannot be combined unless the index and the radicand are the same.

Chapter Test (page 73)

1. $-\frac{10}{3} > -|-4|$ **2.** 56

3. Additive Identity Property

4. (a) -18 (b) $\frac{4}{27}$ (c) $-\frac{8}{343}$ (d) $\frac{8}{729}$

5. (a) 25 (b) 6 (c) 1.8×10^5 (d) 2.7×10^{13}

6. (a) $12z^8$ (b) $\dfrac{1}{(u - 2)^7}$ (c) $\dfrac{3x^2}{y^2}$

7. (a) $15z\sqrt{2z}$ (b) $-10\sqrt{y}$ (c) $\dfrac{2}{v}\sqrt[3]{\dfrac{2}{v^2}}$

8. $-2x^5 - x^4 + 3x^3 + 3$
Degree: 5; leading coefficient: -2

9. $2x^2 - 3x - 5$ **10.** $8x^3 - 20x^2 + 6x - 15$

11. 8, $x \neq 3$ **12.** $\dfrac{x - 1}{2x}$, $x \neq \pm 1$ **13.** $x^2 - 5$