



**A1-2** Answers for Chapter 1

25.  $\frac{2(a+4)}{a-3}$  26.  $\frac{2}{r+2}$  27.  $\frac{k+2}{k+3}$  28.  $\frac{n+4}{n-4}$   
 29. Answers vary. 30. Answers vary. 31.  $\frac{3}{35z}$  32.  $\frac{1}{12z}$   
 33.  $\frac{4}{3}$  34.  $-\frac{1}{4}$  35.  $\frac{20+x}{5x}$  36.  $\frac{3(8-r)}{4r}$  37.  $\frac{3m-2}{m(m-1)}$   
 38.  $\frac{5y-6}{y(y+2)}$  39.  $\frac{37}{5(b+2)}$  40.  $\frac{13}{3(k+1)}$  41.  $\frac{33}{20(k-2)}$   
 42.  $\frac{17}{6(p+4)}$  43.  $\frac{7x-1}{(x-3)(x-1)(x+2)}$   
 44.  $\frac{10m+26}{(m-5)(m+2)(m+4)}$  45.  $\frac{y^2}{(y+4)(y+3)(y+2)}$   
 46.  $\frac{-4r^2+20r}{(r-8)(r-2)(r+4)}$  47.  $\frac{x+1}{x-1}$  48.  $\frac{y-1}{y+1}$   
 49.  $\frac{-1}{x(x+h)}$  50.  $\frac{-2x-h}{(x+h)^2x^2}$  51. (a)  $\frac{\pi x^2}{4x^2}$  (b)  $\frac{\pi}{4}$   
 52. (a)  $\frac{\pi x^2}{36\pi x^2}$  (b)  $\frac{1}{36}$  53. (a)  $\frac{x^2}{25x^2}$  (b)  $\frac{1}{25}$   
 54. (a)  $\frac{x^2}{18x^2}$  (b)  $\frac{1}{18}$  55.  $\frac{-7.2x^2+6995x+230,000}{1000x}$   
 56. \$18.35; \$11.24; \$7.94 57. About \$3.8 million  
 58. About \$4.9 million 59. No 60. No 61. \$2.55  
 62. \$2.94 63. \$6531 64. No

**Section 1.5 (Page 41)**

1. 49 2.  $(-6)^8 = 1,679,616$  3.  $16c^2$  4.  $16x^4$   
 5.  $\frac{32}{x^5}$  6.  $\frac{125}{x^3y^3}$  7.  $108u^{12}$  8.  $\frac{125v^2}{16}$  9.  $\frac{1}{7}$  10.  $\frac{1}{1000}$   
 11.  $-\frac{1}{7776}$  12.  $\frac{1}{x^4}$  13.  $-\frac{1}{y^3}$  14. 36 15.  $\frac{9}{16}$  16.  $\frac{y^4}{x^2}$   
 17.  $\frac{b^3}{a}$  18. Answers vary 19. 7 20. 2 21. About 1.55  
 22.  $288\sqrt{3} \approx 498.83$  23. -16 24. -512 25.  $\frac{81}{16}$  26.  $\frac{4}{3}$  27.  $\frac{4^2}{5^3}$   
 28.  $\frac{1}{7}$  29.  $4^3$  30. 9 31.  $4^8$  32.  $5^3$  33.  $z^3$  34.  $k^3$   
 35.  $\frac{p}{9}$  36.  $\frac{1}{25x^{10}}$  37.  $\frac{q^5}{r^3}$  38.  $\frac{z^6}{8y^6}$  39.  $\frac{8}{25p^7}$  40.  $\frac{1296}{x^{18}}$   
 41.  $2^{5/6}p^{3/2}$  42.  $5^{9/4}k^{13/4}$  43.  $2p + 5p^{5/3}$  44.  $6 + 3x^3$   
 45.  $\frac{1}{3y^{2/3}}$  46.  $c^{3/4}d^{3/4}$  47.  $\frac{a^{1/2}}{49b^{5/2}}$  48.  $\frac{2}{x^{1/2}y^{3/2}}$   
 49.  $x^{7/6} - x^{11/6}$  50.  $3x^2 + 2$  51.  $x - y$   
 52.  $2x^{2/3} + 2x^{1/3}y^{1/2} - x^{1/3}y^{3/2} - y^2$  53. (f) 54. (b) 55. (h)  
 56. (d) 57. (g) 58. (a) 59. (c) 60. (e) 61. 5 62. 2  
 63. 5 64. -2 65. 21 66. 9 67.  $\sqrt{77}$  68.  $\sqrt{33}$   
 69.  $5\sqrt{3}$  70.  $16\sqrt{3}$  71.  $-\sqrt{2}$  72.  $13\sqrt{3}$  73.  $15\sqrt{5}$   
 74. -1 75. 3 76. Answers vary. 77.  $-3 - 3\sqrt{2}$   
 78.  $\frac{\sqrt{3}-1}{2}$  79.  $4 + \sqrt{3}$  80.  $-1 - \sqrt{3}$  81.  $\frac{7}{11 + 6\sqrt{2}}$   
 82.  $\frac{-6}{2 - 2\sqrt{7} - \sqrt{3} + \sqrt{21}}$  83. (a) 14 (b) 85 (c) 58.0  
 84. 73.8 in 85. About \$11.1 billion 86. About \$11.5 billion  
 87. About \$11.7 billion 88. About \$12.0 billion 89. About \$4.2 billion  
 90. About \$5.0 billion 91. About \$5.8 billion  
 92. About \$6.1 billion 93. About 6.1 million 94. About 6.3 million  
 95. About 6.5 million 96. About 6.7 million

**Section 1.6 (Page 50)**

1. 4 2. -3 3. 7 4.  $\frac{6}{5.1} \approx 1.18$  5.  $-\frac{10}{9}$  6.  $\frac{13}{2}$   
 7. 4 8. -6 9.  $\frac{40}{7}$  10. -7 11.  $\frac{26}{3}$  12. -40 13.  $-\frac{12}{5}$   
 14.  $-\frac{48}{71}$  15.  $-\frac{59}{6}$  16.  $-\frac{11}{5}$  17.  $-\frac{9}{4}$  18.  $\frac{29}{12}$  19.  $x = .72$

20. 1.6 21.  $r \approx -13.26$  22. About 1.02 23.  $\frac{b-5a}{2}$   
 24.  $\frac{5a-b}{a+b}$  25.  $x = \frac{3b}{a+5}$  26. 2 27.  $V = \frac{k}{p}$   
 28.  $p = \frac{i}{rt}$  29.  $g = \frac{V-V_0}{t}$  30.  $g = \frac{S-S_0-k}{t^2}$   
 31.  $B = \frac{2A}{h} - b$  or  $B = \frac{2A-bh}{h}$  32.  $F = \frac{9}{5}C + 32$  33. -2, 3  
 34.  $-\frac{9}{4}, \frac{15}{4}$  35. -8, 2 36.  $-\frac{8}{5}, \frac{22}{5}$  37.  $\frac{5}{2}, \frac{7}{2}$  38.  $\frac{1}{8}, \frac{7}{8}$   
 39.  $23^\circ$  40.  $5^\circ$  41.  $71.6^\circ$  42.  $96.8^\circ$  43. 13.12 44. 18.87  
 45. 2018 46. 2020 47. 2021 48. 2025 49. 2011  
 50. 2014 51. 2018 52. 2022 53. 2013 54. 2016  
 55. 2020 56. 2025 57. \$205.41 58. \$92.86 59. \$21,000  
 60. \$8,000 61. \$70,000 for the first plot; \$50,000 for the second  
 62. \$5000 63. About 8.6 million 64. About 14.3 million  
 65. 301 million 66. 300.3 million 67.  $\frac{400}{3}L$   
 68. 4L of 92-octane gasoline and 8L of 98-octane gasoline

**Section 1.7 (Page 58)**

1. -4, 14 2. 16, 5 3. 0, -6 4. 0, 2 5. 0, 2 6. -8, 8  
 7. -7, -8 8. -1, 5 9.  $\frac{1}{2}, 3$  10.  $\frac{1}{3}, -\frac{2}{5}$  11.  $-\frac{1}{2}, \frac{1}{3}$   
 12.  $\frac{1}{3}, 5$  13.  $\frac{5}{2}, 4$  14.  $-\frac{4}{3}, -\frac{3}{2}$  15. -5, -2  
 16.  $\frac{1}{2}, -4$  17.  $\frac{4}{3}, -\frac{4}{3}$  18.  $\frac{7}{6}, -\frac{7}{6}$  19. 0, 1 20. 0, 4  
 21.  $2 \pm \sqrt{7}$  22.  $-4 \pm 3\sqrt{3}$  23.  $\frac{1 \pm 2\sqrt{5}}{4}$   
 24.  $\frac{-5 \pm \sqrt{11}}{3}$  25.  $\frac{-7 \pm \sqrt{41}}{4}; -1.492, -3.3508$   
 26.  $\frac{-1 \pm \sqrt{85}}{6}; 1.7033, -1.3699$  27.  $\frac{-1 \pm \sqrt{5}}{4}; .3090, -.8090$   
 28.  $\frac{3 \pm \sqrt{29}}{2}; 4.1926, -1.1926$  29.  $\frac{-5 \pm \sqrt{65}}{10}; .3062, -1.3062$   
 30.  $\frac{4 \pm \sqrt{10}}{2}; 3.5811, .4189$  31. No real-number solutions  
 32. No real-number solutions 33.  $-\frac{5}{2}, 1$   
 34. No real-number solutions 35. No real-number solutions  
 36.  $\frac{-1 \pm \sqrt{73}}{6}; -1.5907, 1.2573$  37. -5,  $\frac{3}{2}$  38.  $-\frac{1}{5}, 1$   
 39. 1 40. 2 41. 2 42. 0 43.  $x \approx .4701$  or  $1.8240$   
 44.  $x = 13.79$  45.  $x \approx -1.0376$  or  $.6720$  46.  $x \approx .7790$  or  $-3.9890$   
 47. \$43.6 thousand 48. \$57.65 thousand  
 49. 2006 ( $x \approx 5.46$ ) 50. 2013 ( $x \approx 12.45$ )  
 51. 2015 ( $x \approx 14.42$ ) 52. 2016 ( $x \approx 15.47$ ) 53. \$43.19  
 54. \$38.67 55. First quarter of 2017 ( $x \approx 8.14$ ) 56. Second quarter of 2017 ( $x \approx 9.75$ ) 57. About 1.046 ft. 58. 3 ft.  
 59. (a)  $x + 20$  (b) Northbound:  $5x$ ; eastbound:  $5(x + 20)$  or  $5x + 100$   
 (c)  $(5x)^2 + (5x + 100)^2 = 300^2$  (d) About 31.23 mph and 51.23 mph  
 60. About 61 min 61. (a)  $150 - x$  (b)  $x(150 - x) = 5000$   
 (c) Length 100 m; width 50 m 62. 1 ft. 63. 9 ft. by 12 ft.  
 64. Harroun 74.3 mph; Rossi 166.3 mph 65. 6.25 sec.  
 66. 3.5 sec. 67. (a) About 3.54 sec. (b) 2.5 sec. (c) 144 ft.  
 68. (a) About 4.38 sec. (b) 50 sec. 69. (a) 2 sec. (b)  $\frac{3}{4}$  sec. or  $\frac{13}{4}$  sec.  
 (c) It reaches the given height twice: once on the way up and once on the way down.  
 70. (a) About .55 seconds. (b) About .37 seconds.  
 71.  $t = \frac{\sqrt{2Sg}}{g}$  72.  $r = \sqrt{\frac{a}{\pi}}$  73.  $h = \frac{d^2\sqrt{kL}}{L}$   
 74.  $v = \sqrt{\frac{Fr}{kM}}$  75.  $R = \frac{-2Pr + E^2 \pm E\sqrt{E^2 - 4Pr}}{2P}$

76.  $r = \frac{-\pi h \pm \sqrt{\pi^2 h^2 + 2\pi S}}{2\pi}$

**Chapter 1 Review Exercises (Page 61)**

Refer to Section	1.1	1.2	1.3	1.4	1.5	1.6	1.7
For Exercises	1-18, 81-84	19-24, 85-92	25-32	33-38, 93-96	39-60, 97-98	61-68, 99-100	69-80, 101-106

1. 0, 6    2. -12, -6,  $-\sqrt{4}$ , 0, 6    3. -12, -6,  $-\frac{9}{10}$ ,  $-\sqrt{4}$ , 0,  $\frac{1}{8}$ , 6

4.  $-\sqrt{7}$ ,  $\frac{\pi}{4}$ ,  $\sqrt{11}$     5. Commutative property of multiplication

6. Commutative property of multiplication    7. Distributive property

8. Associative property of addition    9.  $x \geq 9$     10.  $x < 0$

11.  $-|3 - (-2)|$ ,  $-|-2|$ ,  $|6 - 4|$ ,  $|8 + 1|$

12.  $-|\sqrt{16}|$ ,  $-\sqrt{8}$ ,  $\sqrt{7}$ ,  $|\sqrt{12}|$     13. -1    14. 0



17.  $-\frac{7}{9}$     18.  $-\frac{1}{10}$     19.  $4x^4 - 4x^2 + 11x$

20.  $-10y^3 + 4y^2 - 5y + 10$     21.  $25k^2 - 4h^2$     22.  $4r^2 - 25y^2$

23.  $9x^2 + 24xy + 16y^2$     24.  $4a^2 - 20ab + 25b^2$

25.  $k(2h^2 - 4h + 5)$     26.  $2n^2(m^2 + 3m + 8)$

27.  $a^2(5a + 2)(a + 2)$     28.  $4x(3x - 1)(2x + 1)$

29.  $(12p + 13q)(12p - 13q)$     30.  $(9z + 5x)(9z - 5x)$

31.  $(3y - 1)(9y^2 + 3y + 1)$     32.  $(5a + 6)(25a^2 - 30a + 36)$

33.  $\frac{9x^2}{4}$     34.  $\frac{5k(3k - 28)}{72}$     35. 4    36.  $\frac{3p^2}{(p + 4)(p + 2)}$

37.  $\frac{(m - 1)^2}{3(m + 1)}$     38.  $\frac{x(x + 1)^2}{2(x^2 + 1)(x - 5)}$     39.  $\frac{1}{5^3}$  or  $\frac{1}{125}$     40.  $\frac{1}{100}$

41. -1    42.  $\frac{36}{25}$     43.  $4^3$     44.  $\frac{1}{7^7}$     45.  $\frac{1}{8}$     46.  $\frac{1}{6^7}$     47.  $\frac{7}{10}$

48.  $\frac{6}{25}$     49.  $\frac{1}{5^{\frac{2}{3}}}$     50. 1    51.  $3^{\frac{7}{5}}a^{\frac{5}{3}}$     52.  $2^{\frac{17}{6}}p^{\frac{31}{6}}$

53. 3    54. Not a real number    55.  $3pq\sqrt[3]{2q^2}$     56.  $2a\sqrt[4]{4ab^3}$

57.  $-21\sqrt{3}$     58.  $14\sqrt{7}$     59.  $\sqrt{6} - \sqrt{3}$

60.  $\frac{16 + 4\sqrt{2} + 4\sqrt{5} + \sqrt{10}}{11}$     61.  $-\frac{1}{3}$     62.  $\frac{7}{2}$     63. No solution

64. No solution    65.  $x = \frac{3}{8a - 2}$     66.  $x = \frac{4b^2}{b^2 - 2}$     67. -38, 42

68.  $2, \frac{1}{5}$     69.  $-7 \pm \sqrt{5}$     70.  $\frac{-1 \pm \sqrt{7}}{2}$     71.  $\frac{1}{2}, -2$

72.  $3, -\frac{5}{2}$     73.  $-\frac{3}{2}, 7$     74.  $-\frac{8}{3}, 2$     75.  $\pm \frac{\sqrt{3}}{3}$     76.  $\frac{\pm\sqrt{3}}{3}$

77.  $r = \frac{-Rp \pm E\sqrt{Rp}}{p}$     78.  $E = \frac{\pm(r + R)\sqrt{pR}}{R}$

79.  $s = \frac{a \pm \sqrt{a^2 + 4K}}{2}$     80.  $z = \frac{h \pm \sqrt{h^2 + 4kt}}{2k}$     81. 82%

82. 19.5%    83. \$1536.25    84. \$23.43    85. 2013    86. 2016

87. 2014    88. 2017    89. 17.05 million    90. 17.68 million

91. March ( $x \approx 2.33$ )    92. October ( $x \approx 9.41$ )

93. About 9.16 million    94. About 8.81 million

95. 2013 ( $x \approx 12.67$ )    96. 2017 ( $x \approx 16.70$ )

97. About \$30.91 billion    98. About \$33.84 billion    99. 11%

100. 10 pounds of beef and 20 pounds of pork    101. About 69.9%

102. 2006    103. 3.2 feet    104. Length is 129 ft; width is 31 ft.

105. About 7.77 seconds    106. About 5.12 seconds

**Case Study 1 Exercises (Page 64)**

1.  $218 + 508x$     2.  $328 + 309x$     3. Electric by \$1880

4. In the first year    5.  $1529.10 + 50x$     6.  $1618.20 + 44x$

7. LG by \$29.10    8. In the 14th year