Chapter 2
Rocket Launch: AREA BETWEEN CURVES

RL-2. a) 1, 4.5, 5.5; \$8, \$12, \$18, \$20, \$23, \$26, \$32 b) 4x; 6(x – 5) + 20

RL-3. a) 25, 16, 9, 4, 1, 0; 1, 3, 5, 7, 9, 11 c) D = (-• , •); R = [0, •); yes, a function (interval notation is not required in students' answers)
d) x = 0

RL-4. a) D= (-• , •); R=(0, 2] and (4, •) b) No; jump at x = 1.

RL-5. a) \$30 d) (\$ /hour)·(hours) = \$

RL-8. a) (x + 2)(x – 1)b) x(x + 2)(x + 4) c) 2(x + 2)(x + 5)

RL-9. a) $8^2 = 64$ m b) $\sqrt{20^2 + 32^2} = 37.736$ m

RL-10. a) x = 0 or 3 b) x = 3 or 9

RL-11. a) $\frac{1}{27}$ b) 9 c) $\frac{25}{9}$ d) 3

RL-12. a) $\sqrt{98} = 7\sqrt{2}$ b) y – 5 = -(x + 2), y + 2 = -(x – 5), y = -x + 3

RL-13. a) $4x^2 + 12x + 9$ b) $x^2 - ax - bx + ab$

RL-14. a) Shift the first graph 2 units to the left.

RL-15. b) f(x) = 0, 0, -2, -3, 0; g(x) = 3, 3, 1, 0, 3

RL-16. Shift f(x) down 5 units to get h(x).

RL-17. b) g(x) = f(x + 2)

RL-18. c) Shifts the graph to the right 1 unit
d) h(x) = (x + 1) for x < 3 ; $(x - 1)^2$ for $x \geq 3$

RL-19. a) $f(x) = 2|x \quad 3| + 1$ b) $f(x) = 2|x + 2| \quad 1$

RL-20. $y = (x - 2)^5 - 2(x - 2) + 3$

RL-21. b) Shifted to the left 2 units c) f(x + 2)

RL-22. a) 2(x + 8)(x – 1) b) 2x(x + 8)(x – 8)

RL-23. x = 1.7, y = 0.1

RL-24. a) $(x^2 + 9y^2)(x + 3y)(x – 3y)$ b) $2x^3(4 + x^4)$

RL-25. a) x = 4.226, y = 9.063 b) x = 12.204, y = 9.997

RL-26. $f\ ^{1}(x) = \frac{x+1}{5}$

RL-27. a) $\frac{10}{\sqrt{2}} = 5\sqrt{2}$ b) 4 cm c) $3\sqrt{3}$

RL-28. 4, 9, 16, 51^2

RL-29. a) 120 b) 206 c) 15.5 d) 46 e) $\frac{4}{5}$

RL-30. He did not use integer values for p.

RL-31. $5, 5\frac{2}{3}, 6\frac{1}{3}$, and 7

RL-33. a) (3, 9) and (-2, 4)
d) The two graphs do not intersect, so there is no point of intersection.

RL-34. a) We need to take the square root of a negative number c) 4**i**

RL-37. 1 ± 2**i**

RL-38. a) 30 b) 30 c) 1080

RL-39. 34.39

RL-40. $^{10}_{k=1}\ k^2$

RL-41. $\boxed{0^2 + 1^2 + 2^2 + 3^2 + 4^2 = 30}$

RL-42. a) -18 – 5**i** b) 1 ± 2**i** c) $5 + \mathbf{i}\sqrt{6}$

RL-43. 1, 1.6, 2.2, 2.8, 3.4, and 4

RL-44. a) -2 + 5**i** b) 1 – 10**i**

RL-45. a) **i** b) -1 – **i**

RL-46. a) Initializes the sum to 0
b) In step 2, change 1 to 7; in step 5, change 5 to 50
c) The loop goes on forever d) In step 3, change k^2 to $\frac{10}{k}$.

RL-48. a) $1^2 + 2^2 + \ldots + 5^2$ b) Expressions: 16, 25; Sum: 14, 30, 55,
c) 1, 5 d) 0, 55

RL-49. c) Since we are using Y1, we need the independent variable X
d) Change the test value of k from 5 to 10 e) 42925

RL-50. Change Y1 to $\mathbf{\frac{10}{x}}$.

RL-51. 34.39

RL-52. a) none; just different variables
b) none; the sum is just expressed differently.

RL-53. b) He walks for 1 hour; 4 c) $\frac{\text{miles}}{\text{hr}} \cdot \text{hr} = \text{miles}$ d) 4 miles

RL-54. i) 7, ii) 18.3, iii) d a) -1 b) -1 c) yes

RL-55. 1

RL-56. a) $7\mathbf{i}$ b) $\sqrt{2}\,\mathbf{i}$ c) -16 d) $-27\mathbf{i}$

RL-57. a) 2, 2.75, 3.5, 4.25, and 5 b) 12.25, 25

RL-58. a) $2(2x - 1)(x + 1)$ b) $(2x - 1)^2(2x - 5)$ c) $(2x - 1)^3(4x^2 + 1)$

RL-59. a) $\frac{5}{18}$ b) $\frac{1}{36}$ c) $\frac{25}{36}$

RL-60. a) 37 b) $31 - 34\mathbf{i}$ c) $1 + 17\mathbf{i}$ d) $-33 + 56\mathbf{i}$

RL-61. $2 \pm \mathbf{i}$

RL-62. c) 45

RL-63. b) miles/hr · hr = miles c) 118.75 miles

RL-64. 19.683

RL-65. $y = 0.2x + 2$ or $y - 3 = 0.2(x - 5)$ or $y - 2.2 = 0.2(x - 1)$

RL-66. $\sum_{k=1}^{5} 0.2k+2$

RL-67. a) 5 b) 34 c) 17 d) 53 e) 3 – 2**i** f) a – b**i**

RL-68. a) $\boxed{\frac{2}{29} \pm \frac{5}{29}\mathbf{i}}$ b) $\boxed{\frac{12}{13} + \frac{5}{13}\mathbf{i}}$ c) $\boxed{\mathbf{\frac{10}{17}}\quad \mathbf{\frac{11}{17}}\mathbf{i}}$

RL-70. a) y = 200x – 75; constant rate of change b) E(x) = 25 for 0 < x 0.5; 200x – 75 for 0.5 < x 0.75; 75 for 0.75 < x 2

RL-72. Change Y1 and the start and end of the index.

RL-73. a) 4 – **i** b) 2 – 7**i** c) 3 + 5**i**

RL-74. g(x) = 3 + 0.5x a) $\boxed{\sum_{i=1}^{4} 0.5\mathbf{i}+3}$ b) 17

RL-75. a) $5^{2/3}$ b) $2^{5/4}$ c) $7^{3/2}$ d) $7^{3/2}$ e) $7^{3/2}$ f) $3^{7/3}$

RL-76. x = 0, -2, 5

RL-77. a) -5**i** b) $\frac{2}{13}\quad \frac{3}{13}\mathbf{i}$ c) $\frac{1}{5}+\frac{3}{5}\mathbf{i}$

RL-78. a) 81 b) 3 c) -3 d) 3**i** e) -3**i** f) 3

RL-79. d) Answer will likely be between 7.75 and 10.75.

RL-80. Answers should range from 4.4 to 4.9.

RL-81. Students should add the results of problems RL-79 and RL-80.

RL-82. a) 4 c) $\sum_{k=0}^{4} 0.4k+3.2$ d) $\sum_{k=0}^{3} 0.2k+2.5$

RL-83. b) $\sum_{k=1}^{4} 0.2k+2.5$

RL-84. 4310

RL-85. c) It tells the index to start at B d) Change X 100 to X E.

RL-86. a) 81 b) $20^2 + 21^2 + ... + 99^2 + 100^2$

RL-87. The equation needs to be entered and the starting and ending values need to be adjusted; 1520

RL-88. b) $g(x) = \begin{array}{ll} x^2 + 2 & \text{for } x < 2 \\ 4 + 2 & \text{for } x \geq 2 \end{array}$; $k(x) = \begin{array}{ll} (x \quad 3)^2 & \text{for } x < 5 \\ 4 & \text{for } x \geq 5 \end{array}$

RL-90. a) -1 and -5 b) Just one at x = -3
c) x = -3 ± 2**i**; it does not cross the x-axis, hence the complex roots.

RL-91. $x = \pm\sqrt{3}$, y = +3

RL-92. c = -2 , b = 4

RL-93. a) $x = \frac{5\sqrt{2}}{2}$ b) x = 4, $y = 4\sqrt{3}$

RL-94. $\boxed{\frac{1 \pm \mathbf{i}\sqrt{5}}{3}}$

RL-95. a) $\mathop{}_{k=1}^{5} 4k$ b) $\mathop{}_{k=0}^{5} 2^k$ c) $\mathop{}_{k=1}^{100} 2k$

RL-96. a) (x + 6)(x – 3)b) (x – 2y)(b + 7)

RL-97. a) (1, 1), (2, 4), (3, 9) b) height c) 1, 2, 3, 4; 1
d) The height of the rectangle is the function value at the left endpoint of each interval, e) 1(1) + 1(4) + 1(9), f) 14

RL-98. a) height b) 1, 2, 3, 4; 1
c) They start from the right endpoint of the interval
d) 1(4) + 1(9) + 1(16) = 29; uses right-endpoint values of the interval.

RL-99. Some possibilities are averaging the two values or using more rectangles.

RL-100. a) 0.5 b) 1, 2.25, 4, 6.25, 9, 12.25
c) They are the y-values of the left-endpoints
d) width, f) $S_6 = \mathop{}_{k=0}^{5} \left[0.5(0.5k+1)^2\right]$

RL-101. 3.75 b) 0.25, 1, 2.25, 4 c) $0.5(0.5^2 + 1^2 + 1.5^2 + 2^2)$

RL-102. $\mathop{}_{k=4}^{19} \frac{k}{2}$ or $\mathop{}_{k=1}^{16} 0.5k + 1.5$. Other answers are acceptable, as well.

RL-103. $\frac{1}{x}$ = -x + 1 means 1 = -x^2 + x so x^2 – x + 1 = 0. This has complex roots, therefore the graphs do not intersect; $\frac{1 \pm \mathbf{i}\sqrt{3}}{2}$

RL-104. no a) -5 ± 3**i** b) 7 ± 2**i** c) $2 \pm \mathbf{i}\sqrt{5}$

RL-105. $\overline{2}$

RL-106. 64; square root 16 and then cube the result.

RL-107. a) x $\frac{10}{3}$

RL-108. a) $\frac{a}{b}$ b) $\frac{c}{b}$ c) $\frac{a}{c}$

RL-109. a) x π -2 b) x 3 c) x π ±1 d) all reals

RL-110. $g(x) = \frac{1}{x \quad 2} \quad 1$

RL-111. a) gain of about 40 million

RL-112. It counted as negative b) 1.5

RL-113. a) 4.5 b) 2.5 c) -3.5
d) There is more area below the x-axis than above.

RL-114. a) 9 b) shifts graph up 2 units; 15; additional 3 by 2 rectangle c) 3

RL-115. a) no change b) add 4 c) nothing; add a rectangle width 2 x k units

RL-116. a) added 2 by 1 rectangle b) 28.656 c) 2a + 8.656

RL-117. a) width of the rectangles b) 13.579 c) 3007.579

RL-118. a) 0.4 b) 4, 4.4, 4.8, 5.2, 5.6, 6.0
c) upper = 0.845, lower = 0.779 d) use more rectangles

RL-119. x^2 – 3 for x ≥ -2, 3x + 7 for x < -2

RL-121. right: 23.2, left: 19.25

RL-122. f(x) = 2x if x 0, 4x if x > 0

RL-123. a) $\frac{b}{a}$ b) $\frac{b}{c}$ c) $\frac{c}{a}$

RL-124. a) 8 b) $2a^2 + 16a + 32$ c) -7, 1 d) $g^{-1}(x) = -3 \pm \sqrt{\frac{x}{2}})$

RL-125. b) $g(x) = \begin{cases} 4 - x^2 & \text{if } x \le 1 \\ x + 2 & \text{if } x > 1 \end{cases}$

RL-126. a) $\frac{15}{x^2 - 2x - 15}$ b) $9x^2 - 121$ c) $25x^2 - 20x + 4$

RL-128. a) 90 miles

b) Area under the curve = the distance traveled; i.e. $hr \cdot \frac{mi}{hr} = mi$ = m

RL-129. a) 0.4 b) 2.0, 2.4, 2.8, 3.2, 3.6, and 4.0 e) $0.4 \sum_{k=0}^{4} 1.5^{2+0.4k}$

RL-130. a) $0.4 \sum_{k=1}^{5} 1.5^{0.4k+2}$

RL-131. a) left = $0.5(\sqrt{11} + \sqrt{14.25} + \sqrt{18} + \sqrt{22.25})$; right = $0.5(\sqrt{14.25} + \sqrt{18} + \sqrt{22.25} + \sqrt{27})$

b) left endpoints = $\sum_{k=0}^{3} 0.5\sqrt{(3 + 0.5k)^2 + 2}$,

right endpoints = $\sum_{k=1}^{4} 0.5\sqrt{(3 + 0.5k)^2 + 2}$

RL-132. W + 15

RL-133. a) upper = 4.031, lower = 3.281 b) $0.25 \sum_{k=1}^{4} (0.25k + 1)^2 + 6$

RL-134. 7.190

RL-135. Verify that $5 + 2\mathbf{i}$ is a solution to $x^2 - 10x = -29$.

RL-136. $(1 + 2\mathbf{i}, 2 + 4\mathbf{i})$, $(1 - 2\mathbf{i}, 2 - 4\mathbf{i})$

RL-137. A = $36\sqrt{3}$

RL-138. $\frac{A}{n-1}$ is larger

RL-139. a) $x = \frac{B \pm C}{A+1}$ b) 0, ±0.5, ±0.5$\mathbf{i}$

RL-140. a) $\frac{1}{3}$ b) $\frac{1}{(\sqrt[5]{10})^3}$ c) $\frac{8}{27}$

RL-141. A = 14

RL-142. a) 8 – 6**i** b) -3 + 11**i**

RL-143. b) 80 c) It's the units!

RL-144. a) 24.5 square units b) It is too high.

RL-145. b) 126 to 130

RL-146. b) 135 miles c) It's the units.

RL-147. b) not as far c) about 66.7 miles

RL-148. a) 7.25 b) It is too high.

RL-149. a) 8.25 square units b) 6.25 square units c) same

RL-150. a) 40 miles b) Vertical distances are halved
c) Draw the picture again or use the fact that the first car always travels twice as fast, so it goes twice as far.

RL-151. a) 0.25 b) 0.36 c) 0.08 d) $\frac{E\ \ B}{N}$

RL-152. a) f(1) b) f(1.36) c) f(10) d) f(9.64)
e) f(B), f(B + W), f(E), f(E – W)

RL-153. 13.567

RL-154. i) 2 ii) 3 iii) 0 iv) 1

RL-155. b) Each graph must intersect at least once.

RL-156. $\boxed{y = \frac{3x}{1\ \ 5x}}$

RL-157. $\frac{3c\ \ 7}{a^2+b^2}$

RL-158. a) 1000 b) $\frac{1}{9}$ c) $\frac{25}{9}$ d) $\frac{9}{a^4}$

RL-159. $\frac{2}{3}$

RL-160. a) (E – B)/N W
c) The height of the Xth rectangle
d) Adds the area of the Xth rectangle
e) We are incrementing by the width of the sub-interval, not by one

RL-161. a) B X and X (E – W)
b) 4.475
c) They will get closer to each other

RL-162. b) 80 miles
c) height

RL-163. a) t
b) One base is 20, and the other is f(x) or 20t + 20
c) $10t^2 + 20t$

RL-165. a) $J(t) = \begin{cases} 5t & \text{for } 0 \quad t \quad 6 \\ 30 + 10(t \quad 6) & \text{for } t > 6 \end{cases}$

b) $C(t) = \begin{cases} 6t & \text{for } 0 \quad t \quad 8 \\ 48 + 12(t \quad 8) & \text{for } t > 8 \end{cases}$

c) 7.6 hours, d) 7.5 < t < 9

RL-166. a) x = ± i, therefore it has no real roots and cannot cross the x-axis
b) We are looking for: one repeated linear factor gives one real root, two different linear factors give two real roots, the quadratic that cannot be factored with real coefficients gives two non-real roots
c) (x + i)(x – i)

RL-167. a) Three real linear factors (one repeated), therefore 2 real (1 single, 1 double) and 0 non-real roots
b) One linear and one quadratic factor, therefore 1 real and 2 complex (non-real) roots
c) Four linear factors therefore 4 real, 0 non-real roots
d) Two linear and one quadratic factor , 2 real and 2 complex (non-real) roots.

RL-168. x = ±2

RL-169. b) $x^2 + y^2 = 4$, $y \geq 0$
c)

RL-170. She needs a 93%.

RL-171. (-4, -3), (2, 6)

RL-173. 2 + 11**i**

RL-174. a) 17162 ft (left endpoint), 19941 ft (right), 18551.5 ft (trapezoidal)
b) y = 23.5x is a pretty good fit
c) 19100 ft
d) 1255 ft/sec, 2806 ft/sec

RL-175. 3.12 to 3.16 depending on left or right rectangles

RL-177. a) $g(x) = 2x^3 + 4$ c) Area under $g(x)$ is twice as large.

RL-178. 41

RL-180. a) repeat 1, i, -1, **-i**, etc. b) 1, i, -1, **-i**

RL-181. a) 1 b) **i** c) -1

RL-183. He needs an 86%.

RL-184. Since the denominator on the first fraction is smaller and both fractions have the same numerator, the first fraction is larger than the second.

RL-185. a) $a(a + 8)$ b) $(x + 2)(x + 10)$ c) $(2y – 1)(2y + 7)$

RL-186. a) 2 b) -2 c) -4 d) -5

RL-187. $n = \frac{pk}{u}$

RL-189. a) $0.5(2^1 + 2^{1.5} + 2^2 + 2^{2.5} + 2^3 + 2^{3.5})$
b) $0.5(2^{1.5} + 2^2 + 2^{2.5} + 2^3 + 2^{3.5} + 2^4)$
c) $0.5(\frac{2^1+2^{1.5}}{2} + \frac{2^{1.5}+2^2}{2} + \frac{2^2+2^{2.5}}{2} + \frac{2^{2.5}+2^3}{2} + \frac{2^3+2^{3.5}}{2} + \frac{2^{3.5}+2^4}{2})$

RL-192. a) A(3x – 7, 2   x   7) b) $\boxed{{}_{3}^{8}\ 2x^2dx}$

RL-193. lower: left-endpoint rectangles, upper: trapezoids

RL-194. b) 30, 60, 90, 120, 140, 160
d) d(t) = 60t for t   2, 120 + 40(t – 2) for t > 2

RL-195. a) 5 sub-intervals of width 0.4 b) 1   x   3
c) $0.4 \ {}_{k=0}^{4}\ 2^{0.4k+1}$ d) left

RL-196. a) $\boxed{{}_{1}^{3}\ [\ \ (x\ \ \ 1)^2 + 4]\,dx}$ c) 5.13 d) lower
e) more sub-intervals

RL-198. a) The sum gives a lower bound b) The sum gives an upper bound.

RL-199. a) 34 c) $\int_{2}^{5} f(x)\,dx$ and $\int_{5}^{2} h(x)\,dx$

RL-200. a) $f^{-1}(x) = \frac{x^3}{64} + 2$ b) $f^{-1}(x) = \frac{3}{2x-3}$
c) x = 2.108 and -2.608 d) $x = \log_5 8$

RL-201. a) 8 + 17 + 32 + 53 b) $0.2\sum_{k=0}^{4} 4^{0.2k+3}$ c) $A(4^x, 3 \le x \le 4)$

RL-202. a) The roots are complex numbers
b) $y = (x-3)^2 + 4$ or $x^2 - 6x + 13$ c) $x = 3 \pm 2\mathbf{i}$

RL-203. a) V = 360 cm^3, A = 312 cm^2 b) V = 288 cm^3, A = 288 cm^2

RL-205. a) $4^2 = 16$ b) $6^{-2} = \frac{1}{36}$ c) $10^3 = 1000$

RL-206. a) 2 b) 4 c) 8

Interlude

Introduction to Logarithms

IL-1. a)

x	y
625	4
1/5	[-1]
5	[1]
125	[3]
1	0
-1	[none]
0	[none]
25	2
1/25	[-2]
$\sqrt{5}$	1/2

b) $x = 5^y$]

IL-2. a) $5^4 = 625$ b) $y = \log_5(x)$

IL-3. a) 4 b) 3 c) 2

IL-4. a) $2^3 = 8$; b) $6^4 = 1296$; c) $7^{-2} = \frac{1}{49}$ d) $9^{1/2} = 3$

IL-5. a) $x = \log_7 y$; b) $x = 4^y$ c) $y = \log_{11} x$ d) $K = \log_W(B)$

e) $B = W^K$ f) $P = \left(\frac{1}{3}\right)^Q$

IL-6. a) $b^L = N$ b) $\log_b b^L = L$ c) $b^{\log_b N} = N$

IL-7 a) 5 b) -4: c) 12 d) 4x

IL-8. f(x) D: all reals, R: y > 0, no zeroes; g(x) D: x > 0, R: all reals, zeroes: x = 1

IL-9. a) 4 b) 9, 2 c) x d) $y = \log_3 x$ e) $x = 3^y$ f) yes

IL-10. a) 1 b) 0 c) -1

IL-11. a) 81 b) 4 c) $\frac{1}{9}$ d) -2 e) $\sqrt{3}$] f) $\frac{1}{2}$

IL-12 a) 0 b) 7, LS 7 = 1 c) 5 d) w = $\boxed{\frac{1}{25}}$, d = $\boxed{\sqrt{5}}$]IL-13. a) $\frac{1}{2}$ b) -3 c) $\frac{3}{2}$ d) 0 e) $\frac{3}{2}$ f) -3

IL-14. a) (2x + y)(2x – y) b) $(3z^2 - y)(3z^2 + y)$ c) $2(x^2 + 2y)(x^2 - 2y)$

L-15. a) 1 = b) $\sqrt{3}^4 = 9$ c) $6^0 = 1$

IL-16. a) -3 b) $\frac{1}{3}$ c) 6 d) 3

IL.17 a) yes; b) no; c) log 2 + log 3 = log 6; d) log 2 + log 4 = log 8
e) log 3 + log 4 = log 12 f) Since log 10 = 1, log 5 + log 2 = log 10.
The pattern is confirmed. g) log xy

IL-18. a) Both sides = 5. True in all cases. b) Both sides = $\frac{5}{2}$. c) Both sides = -3.

Il-19. No. Following a pattern is not a proof—the pattern may break down with more examples. We haven't shown WHY this is always true.

IL-20. a) log 6 – log 2 = log 3 b) log 8 – log 4 = log 2 c) log $\boxed{\frac{x}{y}}$

IL-22. a) log 4 b) log 8 c) log 16 d) log $\boxed{\frac{1}{25}}$ e) log 8 f) $\log x^n$

IL-27. a) $\log_5 32$ or $5 \log_5 2$ b) log 5 + log 7 c) Impossible. Logs are being multiplied, not added. d) Impossible. Arguments are being added, not multiplied. (log 12 is correct, but no log law is used.)
e) Impossible. Bases are different. f) $\log_3 25$

IL-28. a) $\log_5 6$ b) 2 log 3 c) $\log MN^2$ d) $\log\left(\frac{P^2}{Q}\right)$

IL-29. a) 1.587 b) 2.512 c) 2.512

IL-30. a) $10^{(7/10)}$ b) c = $\frac{1}{10}$ c) $(\sqrt[10]{10})^7$]
d) Taking the root first makes the numbers smaller. e) same f) 5.012
g) 0.699 h) She can calculate log 5 = 0.6989since $10^{\log 5} = 5$.

IL-31. 14.2067 IL-32. b) short = x, long = $x\sqrt{3}$ c) $x\sqrt{2}$]

IL-33. a) 107 + 255 + 499 + 863 = 1724 b) $0.4 \ {}_{i=1}^{5} \frac{1}{0.4x+1.6}$; others are possible.

IL-34. a) y = $\frac{1\ \ x^2}{2}$, y = 2x – 2 b) (1, 0), (-5, -12)

IL-35. a) 2 log M + log N b) $\frac{1}{2}(\log M \quad \log N)$ c) 2 log M – 3 log M]

IL-36. a) $y = x^2$ b) $y = x^{-1}$ or $\frac{1}{x}$ c) $y = 5x^3$

IL-38. 14.207 years IL-39. a) 1.921 b) 0.790 c) 13.513

IL-40 a) yes b) We do not know how to use a calculator to find $\log_6 260$.
c) 3.103 d) yes

IL-41. a) 2.183 b) use Y1 = $\frac{\log x}{\log 5}$

IL-42. a) 1.7, 1.8, 1.9 would all be reasonable because $3^2 = 9$, and 8 is a bit less than 9. c) 1.893 d) 8 $\ \ 3^{1.893}$

IL-43. a) t = $\frac{\log 0.6}{\log 0.9}$ b) 4.848 hours or 4 hours, 51 minutes

IL-45. a) 1 b) 3 c) d) -2 e) impossible f) $\frac{3}{5}$
g) h) impossible i)

IL-47. The hypotenuse is the longest side of a right triangle, but $\sqrt{3} < 2$.

IL-48. (8, 4) or (-8, -4) IL-49. a) 0 x 1 since it is a probability.
b) 1 – x c) $x^2 + (1 – x)^2$ or $2x^2 – 2x + 1$ d) $\frac{x^2}{2x^2 \pm 2x + 1}$

IL-50. a) 2.262 b) 18.854 IL-51. a) $\frac{1}{3}$ b) 0

IL-52. a) 135 b) geometric c) The increase is 200%, even though each dose is 300% of the previous dose. d) dose e) d = $\frac{5}{3}$◊3^{r} or d = 5◊$3^{r\pm1}$
f) r = $\frac{\log 3+\log d \quad \log 5}{\log 3}$

IL-53. a) $10^{3/2} = 31.623$ b) M = $\frac{2}{3}$ log E – 2.87 c) 5.69 x 10^{16} joules
d) $10^{1.5(8.3–7.1)}$ 63.1 times

IL-54. 2, acidic; 4.52, acidic; 7, neutral; 7.30, alkaline; 9, alkaline

IL-55. a) 2 b) 3 c) 0 d) -2 e) -1 f) -$\frac{1}{2}$

IL-56. a) $\frac{3}{2}$ b) -$\frac{6}{5}$ c) -6

IL-57. Domain: -2 < x; Range: -• < y <•

IL-58. a) x > $\frac{1}{2}$ b) x π 0 c) x π 2 d) all reals

IL-59. a) -$\frac{11}{4}$ b) $\pm\sqrt{5}$ c) 2 d) $\pm\frac{\sqrt{6}}{2}$ e) 4

IL-60. a) 2.5 b) -3.2 c) 1.3 d) 7.6

IL-61. a) A = 314.159 cm^2, C = 62.832 cm
b) A = 235.619 cm^2, C = 47.124 cm

IL-62. A = 235.619 ft^2

