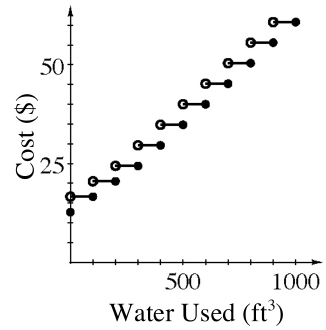
Lesson 2.1.1

2-4. **a:** See graph at right.

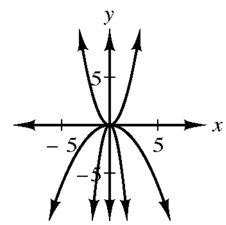


b: Yes, for every possible amount of water usage, there is only one possible cost.

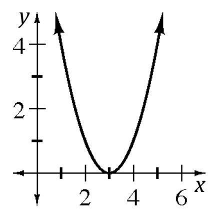
c: Domain: 0 to 1,000 cubic feet; range: discrete values including: \$12.70, \$16.60, \$20.50, \$24.40, \$29.60, \$34.80, \$40, \$45.20, \$50.40, \$55.60, \$60.80

2-5. Smallest: a: 2; b: 0; c: –3; d: none.
Largest: a: none. b: none. c: none. d: 0. e: At the vertex.

2-6. The negative coefficient causes parabolas to open downward, without changing the vertex. See graph at right.

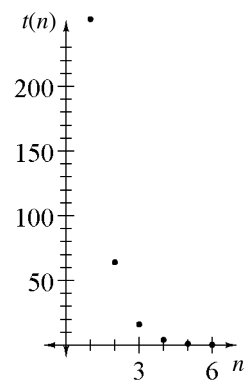


2-7. **a:** Parabola with vertex (3, 0), see graph at right.



b: Shifted to the right three units.

2-8. **a:** 4, 1, 0.25; $t(n) = 256(0.25)^{n-1}$



b: They get smaller, but are never negative.

c: See graph at right. They get very close to zero.

d: The domain is n integers greater than or equal to zero. The domain of the function is all real numbers.

2-9. **a:** $y = -\frac{2}{3}x - 4$ **b:** $y = 2$

c: $x = 2$ **d:** $y = \frac{2}{3}x - \frac{8}{3}$

2-10. $n = 24$; $\sqrt{650} = 5\sqrt{26}$

Lesson 2.1.2

2-16. Answers will vary.

2-17. **a:** (0, –6)

b: (–6, 0) and (1, 0)

c: x-intercepts at (0, 0) and (–5, 0) and y-intercept at (0, 0); the graph of $p(x)$ is 6 units lower than $q(x)$

d: –6

2-18. **a:** $z = 1.5$ **b:** $z = -\frac{18}{5}$ **c:** $z = 8$ **d:** $z = -3, 2$

2-19. **a:** 3 **b:** $\frac{1}{x^2y^4}$ **c:** $\frac{\sqrt{y}}{x}$

2-20. **a:** $3p + 3d = 22.50$ and $p + 3d + 3(8) = 37.5$, so popcorn costs \$4.50 and a soft drink costs \$3.00.

b: Answers will vary.

2-21. **a:** $\sqrt{146} \approx 12.1$ **b:** $\sqrt{145} \approx 12.0$ **c:** $\sqrt{50} \approx 7.1$ **d:** $5\sqrt{2}$

2-22. Maximum profit is \$25 million when $n = 5$ million.

2-23. **a:** vertex at (–3, –8), opens up, vertically stretched.

b: x-intercepts (–5, 0) and (–1, 0); y-intercept (0, 10)

2-24. **a, b, and c:** Answers will vary.

2-25. **a:** $y = (x-8)^2 - 5$ **b:** $y = 10(x+6)^2$ **c:** $y = -0.6x(x+7)^2 - 2$

2-26. Answers will vary.

2-27. **a:** $5\sqrt{2}$ **b:** $6\sqrt{2}$ **c:** $3\sqrt{5}$

2-28. **a:** $x = 46.71$ **b:** $x = 8.19$

2-29. About \$ 365.00. **b:** $y = 300(1.04)^x$

Lesson 2.1.3

2-35. **a:** $y = 0$ or 6 **b:** $n = 0$ or -5 **c:** $t = 0$ or 7 **d:** $x = 0$ or -9

2-36. **a:** $(7,-16)$, $y = (x-7)^2 - 16$ **b:** $(2,-16)$, $y = (x-2)^2 - 16$

c: $(7,-9)$, $y = (x-7)^2 - 9$ **d:** $(2,-1)$

2-37. **a:** $(2,-1)$

b: When $x = 2$, $(x-2)^2$ will equal zero and $y = -1$, the smallest possible value for y in the equation. So the y-value of the vertex is the minimum value in the range of the function.

2-38. **a:** 9.015 gigatons

b: $C(x) = 8(1.01)^{(x+2)}$ if x represents years since 2000 or $8.16(1.01)^{x}$.

2-39. **a:** 2 **b:** 1 **c:** 1 **d:** 2 **e:** 2 **f:** 1

h: If the factored version includes a perfect-square binomial factor, the parabola will touch at one point only.

2-40. **a:** 4 **b:** $\frac{1}{16x^4y^{10}}$ **c:** $6xy^3$

2-41. **a:** $\frac{8}{27}$ **b:** $\frac{12}{27}$ **c:** $\frac{6}{27}$ **d:** $\frac{1}{27}$

Lesson 2.1.4

2-50. **a:** $f(x)=(x+3)^2+6$ $(-3, 6), x=-3$

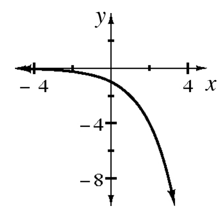
b: $y=(x-2)^2+5$, $(2, 5)$ $x=2$

c: $f(x)=(x-4)^2-16$, $(4, -16), x=4$

d: $y=(x+3.5)^2-14.25$, $(-3.5, -14.25), x=-13.5$

2-51. $\frac{b^2}{a}$

2-52. The second graph is a reflection of the first across the x-axis. See graph at right.



2-53. **a:** $\sqrt{45}=3\sqrt{5}\approx 6.71$; $y=\frac{1}{2}x+5$ **b:** 5; $x=3$

c: $\sqrt{725}\approx 26.93$; $y=-\frac{5}{2}x+\frac{5}{2}$ **d:** 4; $y=-2$

2-54. After x is factored out, the other factor is a quadratic equation. After using the Quadratic Formula the solutions are $x=\frac{-23\pm\sqrt{561}}{8}$ or 0.

2-55. **a:** $x=21$ **b:** $x=10\sqrt{5}\approx 22.4$ **c:** $x=50$

2-56. **a:** $\frac{1}{4}$ **b:** $\frac{1}{3}$

2-57. B

2-58. **a:** A cylinder **b:** $45\pi=141.37$ cubic units

2-59. **a and b:** Answers will vary. **c:** A circle.

2-60. (5, 14)

2-61. **a:** 0.625 hours or about 37.5 minutes.

b: 0.77 hours or about 46.2 minutes.

c: About $22.99 per minute.

2-62. **a:** $\sqrt{61}$ **b:** 30° **c:** $\tan^{-1}(\frac{4}{5})$ **d:** $5\sqrt{3}$

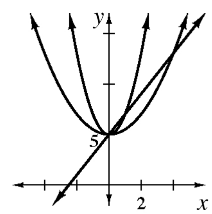
2-63. **a:** Years; 1.06; 120,000; $120000(1.06)^x$

b: Hours; 1.22; 180; $180(1.22)^x$

Lesson 2.1.5

2-69. Answers will vary.

2-70. See graph at right.



a: It is the slope.

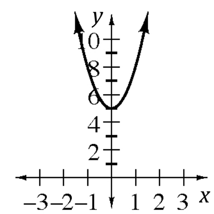
b: No, because only lines have (constant) slopes. This 2 is the stretch factor.

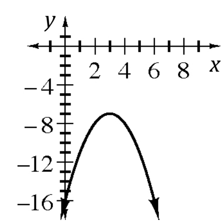
2-71. **a and b:** No. Answers will vary.

2-72. **a:** $y = 0.25 \cdot 6^x$ **b:** $y = 12 \cdot 0.3^x$

2-73. **a:** x: $(1, 0)$, $\left(-\frac{5}{2}, 0\right)$, y: $(0, –5)$ **b:** x: $(2, 0)$, y: none

2-74. See graphs at right.





a: stretched parabola, vertex $(0, 5)$

b: inverted parabola, vertex $(3, –7)$

2-75. **a:** $x = \pm 5$ **b:** $x = \pm \sqrt{11}$

Lesson 2.2.1 (Day 1)

2-81. Possible equation: $y=-\frac{4}{25}(x-5)^2+8$, standing at $(0,0)$
domain: $0 \le x \le 10$; range: $4 \le y \le 8$

2-82. **a:** $x:(-\frac{1}{2},0),(-1,0);\ y:(0,1)$ **b:** $x=-\frac{3}{4}$
c: $\left(-\frac{3}{4},-\frac{1}{8}\right)$ or $(-0.75,-0.125)$

2-83. Move it up 0.125 units: $y=2x^2+3x+1.125$

2-84. **a:** $2\sqrt{6}$ **b:** $3\sqrt{2}$ **c:** $2\sqrt{3}$ **d:** $5\sqrt{3}$

2-85. **a:** Years; 0.89; 12250; $12250(0.89)^x$ **b:** Months; 1.005; 1000; $1000(1.005)^x$

2-86. **a:** 32 **b:** $x^2y^2\sqrt{x}$ **c:** $\frac{x^2}{y}$

2-87. $c+m=18$ and $\$4.89c+\$5.43m=\$92.07$
10.5 lbs. of Colombian and 7.5 lbs. of Mocha Java.

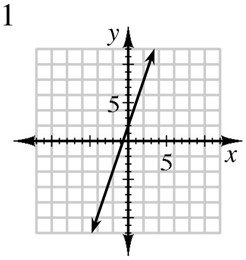
Lesson 2.2.1 (Day 2)

2-88. **a:** 15 ft

b: Surface area of concrete: 793.14 sq. ft.; 528.76 cu. ft.; $1,263.74

2-89. **a:** See graph at right. **b:** $y=3x+2$ **c:** 2, 5, 8, 11

d: One is continuous and one is discrete. They have the same slope so the "lines" are parallel, but they have different intercepts.



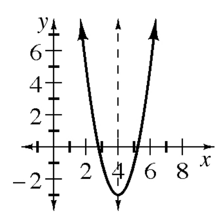
2-90. **a:** $4.116\cdot10^{12}$ **b:** $y=1.665(10^{12})(1.0317)^t$

c: Answers will vary.

2-91. **a:** $6\sqrt{x}+3\sqrt{y}$ **b:** 32 **c:** 5 **d:** $\frac{\sqrt{3}}{2}$

2-92. **a:** $6x^3+8x^4y$ **b:** $x^{14}y^9$

2-93. See graph at right. line of symmetry $x=4$



2-94. **a:** $4\pi+\frac{4}{3}\pi\approx16.755\,m^3$ **b:** No; r, r^2, r^3 relationship; $V=\frac{80\pi}{3}\approx83.776\ \text{m}^3$
c: $V=\frac{4}{3}\pi r^3+4\pi r^2$

Lesson 2.2.1 (Day 3)

2-95. **a:** $y=\frac{1}{x+2}$ **b:** $y=x^2-5$ **c:** $y=(x-3)^3$ **d:** $y=2^x-3$

e: $y = 3x - 6$ **f:** $y=(x+2)^3+3$ **g:** $y=(x+3)^2-6$ **h:** $y=-(x-3)^2+6$

i: $y=(x+3)^3-2$

2-96. He should move it up 6 units or redraw the axes 6 units lower.

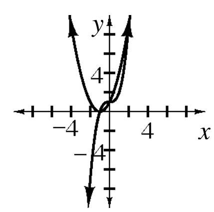
2-97. **a:** 18 **b:** $\frac{3}{2}$ **c:** $\frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$ **d:** $11+6\sqrt{2}$

2-98. **a:** $(2x - 3y)(2x + 3y)$ **b:** $2x^3(2+x^2)(2-x^2)$

c: $(x^2+9y^2)(x-3y)(x+3y)$ **d:** $2x^3(4+x^4)$

2-99. $x=\frac{-by^3+c+7}{a}$

2-100. **a:** $t(n) = -6n + 26$ **b:** $t(n)=-1.5(4)^n$ or $-6(4)^{n-1}$



2-101. **a:** See graph at right. **b:** 2

c: –1 **d:** $\sqrt[3]{-13}$

e: no solution **f:** Three because the graphs cross three times.

g: x^3-x^2-2x

Lesson 2.2.2 (Day 1)

2-107. **a:** $y = (x-2)^2 + 3$ **b:** $y = (x-2)^3 + 3$ **c:** $y = -2(x+6)^2$

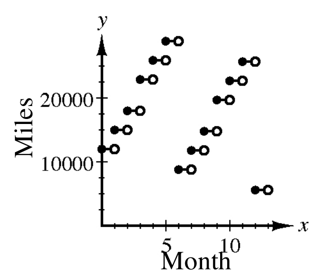
2-108. **a:** D: all real numbers, R: $y \geq 3$ **b:** D and R: all real numbers
c: D: all real numbers, R: $y \leq 0$

2-109. **a:** compresses or stretches **b:** shifts up or down
c: shifts left or right **d:** shifts up or down

2-110. **a:** $y = 0.4 \cdot 0.5^x$ **b:** $y = 8 \cdot 2^x$

2-111. **a:** $\frac{2}{25}$ **b:** $\frac{3x^2y^3}{z^4}$ **c:** $54m^4n$ **d:** $y\sqrt[3]{5x^2z}$

2-112. **a:** See table and graph at right.
b: He had 28,900 miles in May.
c: 5600 miles
d: No, he will not be able to go in December, he will only have 24,200 miles.



Month	Miles
1	15,000
2	18,000
3	22,900
4	25,900
5	28,900
6	8,800
7	11,800
8	14,800
9	19,700
10	22,700
11	25,700
12	5,600

2-113. **a:** $x = \pm\sqrt{\frac{y}{2}} + 17$ **b:** $x = (y+7)^3 - 5$

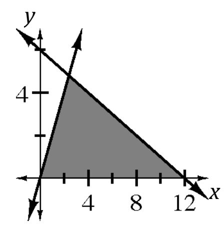
Lesson 2.2.2 (Day 2)

2-114. **a:** $(10, 48)$ **b:** $\left(\frac{29}{5}, \frac{9}{5}\right)$

2-115. **a:** $8\sqrt{3}$ **b:** $3\sqrt{x}$ **c:** 12 **d:** 108

2-116. **a:** $g\left(\frac{1}{2} = -4.75\right)$ **b:** $g(h+1) = h^2 + 2h - 4$

2-117. See graph at right.



a: $y = 2x : (0, 0)$, $y = -\frac{1}{2}x + 6 : (0, 6), (12, 0)$

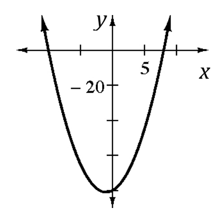
b: It should be a triangle with vertices $(0, 0)$, $(12, 0)$, and $(2.4, 4.8)$.

c: Domain $0 \le x < 12$, Range $0 \le y \le 4.8$

d: $A = \frac{1}{2}(12)(4.8) = 28.8$ square units

2-118. $y \approx 2(x-5)^2 + 2$ and $y \approx -\frac{1}{2}(x-5)^2 + 2$

2-119. See graph at right.



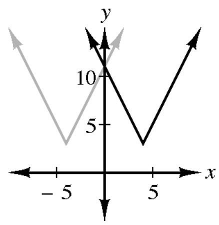
$y = (x+1)^2 - 81$; x-intercepts: $(-10, 0)$, $(8, 0)$, y-intercept: $(0, -80)$; vertex: $(-1, -81)$

2-120. Yes, when $n = 117$.

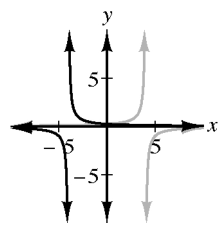
Lesson 2.2.3

2-125. **a and :** Neither **c:** Even

2-126. **a:**



b:



c: Neither function is odd nor even.

2-127. $y=-\frac{3}{4}(x-2)^2+3$

2-128. **a:** x: $(-1,0)$, y: $(0,2)$
V: $(-1,0)$, $y=2(x+1)^2$

b: x: $(0,0)$, $(2,0)$, y: $(0,0)$
V: $(1,1)$, $y=-(x-1)^2+1$

2-129. **a:** $y=x$ **b:** $\left(\frac{1}{2},\frac{1}{3}\right)$ **c:** $\left(\frac{1}{2},\frac{1}{3}\right)$

d: The solution to the system is the point at which the lines intersect.

2-130. **a:** $t(n)=40(\frac{1}{4})^n$ or $10(\frac{1}{4})^{n-1}$ **b:** $t(n)=-6n+4$

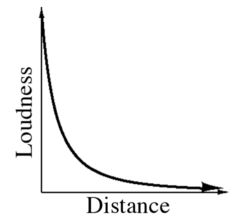
2-131. **a:** x: $(2,0)$, $(6,0)$ y: $(0,2)$ vertex $(4,-2)$, D: all real numbers; R: $y\geq-2$

b: x: $(-4,0)$, $(2,0)$ y: $(0,2)$ vertex $(-1,3)$, D: all real numbers; R: $y\leq 3$

Lesson 2.2.4

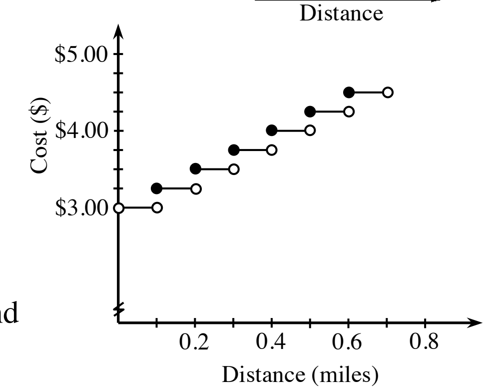
2-139. $y=(x+3.5)^2-20.25$

2-140. **a:** See graph at right.



b: Loudness depends on distance.

2-141. See graph at right. The domain is all positive numbers (or $d>0$). The range is all real numbers greater than 3 and that are multiples of 0.25.



2-142. Answers will vary.

2-143. The second graph shifts the first 5 units left and 7 units up and stretches it by a factor of 4.

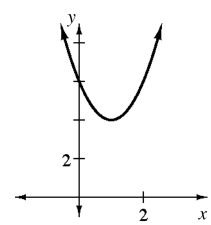
2-144. **a:** x^2-1 **b:** $2x^3+4x^2+2x$

c: x^3-2x^2-x+2 **d:** y: (0, 2), x: (1, 0), (–1, 0), (2, 0)

2-145. **a:** $(a,b)=\left(2,\pm\frac{1}{2}\right)$ **b:** $(a,b)=\left(\frac{1}{2},\pm 2\right)$

2-146. **a:** $y=-\frac{5}{9}(x-3)^2+5$ **b:** $x=-\frac{3}{25}(y-5)^2+3$

2-147. See graph at right.



a: $y=2x^2-4x+6$

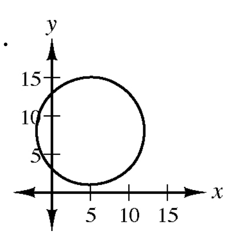
b: There is no difference, but the explanations vary.

c: $y=x^2$

d: $y=x^2$

2-148. **a:** The graph will be a circle with a center at (5, 8) and a radius of 7.

b: See graph at right.



2-149. **a:** –2 **b:** –2 **c:** $\frac{1}{2}$ **d:** –1

e: The product of the slopes of any two perpendicular lines is –1.

2-150. Answers will vary.

2-151. **a:** (0, 0), (–24, 0), and (0, 0) **b:** (6, 0), (10, 0), and (0, 60)

2-152. (3, 2)

Lesson 2.2.5

2-162. $x < 2, y = -(x-2)^2$; $x \geq 2,\ y = x + 2$

2-163. Any function for which $f(x) = f(-x)$. On a graph, the function will have the *y*-axis as its line of symmetry.

2-164. $y = -2|x+3| + 4$

2-165. **a:** $(x+2)^2 + (y-3)^2 = 4$ **b:** $(x-12)^2 + (y+15)^2 = 81$

2-166. $y = (x-2.5)^2 + 0.75$, vertex $(2.5, 0.75)$

2-167. He is incorrect. Answers will vary.

2-168. $f(x) = x^2 + 1$

2-169. ± 11, ± 9, ± 19