Lesson 6.1.1

6-8. **a:** Their y- and z-coordinates are zero. **b:** Answers will vary.

6-9. $x = -2, y = 5$

6-10. **a:** 9 **b:** $4N - 3$, arithmetic

6-11. **a:** $x \approx 1.204$ **b:** $x \approx 1.613$ **c:** $x = 6$ **d:** $x \approx 2.004$

6-12. **a:** $\frac{1}{25}$ **b:** $\frac{x}{y^2}$ **c:** $\frac{1}{x^2y^2}$ **d:** $\frac{b^{10}}{a}$

6-13. **a:** x **b:** $\frac{6}{x^2-3x+2}$

6-14. **a:** $\frac{1}{2}$

b: -2

c: The product of the slopes is -1, or they are negative reciprocals of each other.

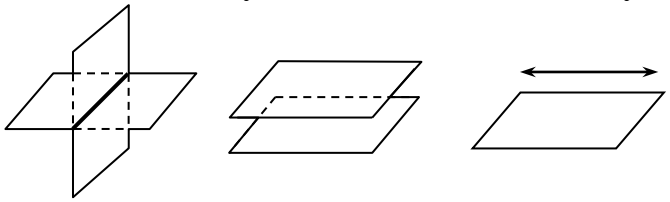
6-15. Heather is correct, because a 4% decrease does not "undo" a 4% increase.

Lesson 6.1.2

6-21. **a:** (0, 10, 0), (0, 0, 4) **b:** (8, 0, 0), (0, 6, 0), (0, 0, 12)

c: (0, 0, 4), (0, 0, –4), (2, 0, 0) **d:** (0, 0, 6)

6-22. A line **b:** They do not intersect. **c:** They do not intersect.



6-23. **a:** $y = -2(x+4)^2 + 2$ **b:** $y = \frac{1}{x-2}$ **c:** $y = -x^3 + 3$

6-24. It is not the parent. The second equation does not have a vertical asymptote, and it has a maximum value, while $y = \frac{1}{x}$ does not.

6-25. **a:** $x = \frac{b}{3}$ **b:** $x = \frac{b}{5a}$ **c:** $x = \frac{b}{1+a}$

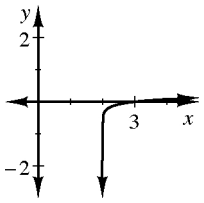
6-26. **a:** No, input equals output only if $x \geq 0$.

b: The output is the absolute value of the input value.

c: $n + 2$, $n^2 - 4$, $|n|$

d: Because $\sqrt{x^2} = |x|$.

6-27. It is the $\log_5(x)$ graph shifted 2 units to the right.
See graph at right.

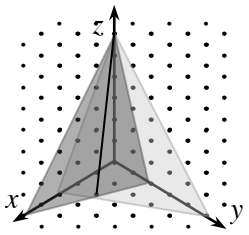


6-28. **a:** 254,000 people/year **b:** 1,574,000 people/year **c:** 1960 to 2010

6-29. **a:** –7 **b:** –102 **c:** –102 **d:** –132

Lesson 6.1.3

6-35. See graph at right.



6-36. Yes.

6-37. Answers will vary.

6-38. $y \le -x + 4,\ y \ge \frac{1}{3}x$

6-39. **a:** $\frac{x+3}{2x-1}$ **b:** $\frac{1}{(x-3)}$

6-40. **a:** Most solving strategies will yield $x = 8$ or $x = 1$.

b: $x = 1$ does not check, so it is extraneous.

6-41. **a:** $x = -4$ or $x = \frac{5}{2}$ **b:** $x = -4, 2,$ or 3

6-42. **a:** Neither **b:** Even

6-43. $x = 3, y = 1, z = 3$

Lesson 6.1.4

6-51. $(1, -2, 4)$

6-52. **a:** ≈ \$140,809.30 **b:** ≈ 24.2 years **c:** ≈ \$164,706.25

6-53. $x = 7$

6-54. **a:** They both equal 16, but this is a special case (for example, $5^3 \neq 3^5$).

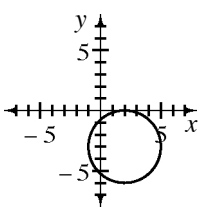
6-55. **a:** $x = 6.5$ **b:** $x = -3.75$ or $x = 5$

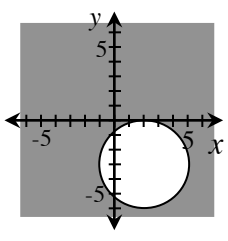
6-56. **a:** $y = \frac{1}{3}x + 5$ **b:** $y = 2x + 5$ **c:** $y = -\frac{1}{2}x + \frac{15}{2}$ **d:** $y = 2x$

6-57. **a:** $y = -x^2 + 4x$ **b:** $y = 5 \pm \sqrt{x - 3}$

6-58. **a:** See graph right.

b: See graph far right.





6-59. 384 feet

Lesson 6.1.5

6-71. $x = -1, y = 3, z = 5$

6-72. $y = 3x^2 - 5x + 7$

6-73. **a:** $\frac{x+3}{x-4}$ **b:** $\frac{1}{x(x+2)}$

6-74. **a:** $y + \frac{x}{2}$ **b:** $2b + 4a^2$ **c:** $6x - 1$ **d:** xy

6-75. **a:** $x = 12^y$ **b:** $y^x = 17$ **c:** $2x = \log_{1.75} y$ **d:** $7 = \log_x 3y$

6-76. $x = 14$

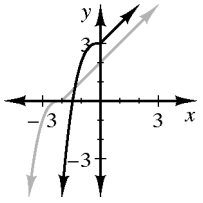
6-77. **a:** ≈ 0.0488 grams

b: Roughly between 4600 and 6700 depending on how the base is rounded.

c: Never

6-78. **a:** See graph at right.

b: $x > -2;\ y = |x + 2|$ and $x \le -2;\ y = (x + 2)^3$



6-79. **a:** 2^4 **b:** 2^{-3} **c:** $2^{1/2}$ **d:** $2^{2/3}$

6-80. $x = -1, y = 3, z = 6$

6-81. $y = 2x^2 - 3x + 5$

6-82. **a:** $24 = b^a$ **b:** $7 = (2y)^{3x}$ **c:** $5x = \log_2 3y$ **d:** $6 = \log_{2q} 4p$

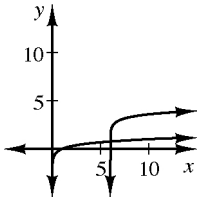
6-83. **a:** $\frac{3}{x+1}$ **b:** $\frac{x-4}{x^2-3x+2}$

6-84. Yes, Hannah is correct; $4(x-3)^2 - 29 = 4x^2 - 24x + 7$ and $4(x-3)^2 - 2 = 4x^2 - 24 + 34$

6-85. **a:** $y = 2(x-2)^2 - 1$, vertex $(2, -1)$, axis of symmetry $x = 2$

b: $y = 5(x-1)^2 - 12$, vertex $(1, -12)$, axis of symmetry $x = 1$

6-86. See graph at right. $y = \log(x - 6) + 3$



6-87. **a:** $2a^2 - 4$ **b:** $18a^2 - 4$ **c:** $2a^2 + 4ab + 2b^2 - 4$

d: $2x^2 + 28x + 94$ **e:** $50x^2 + 60x + 14$ **f:** $10x^2 - 17$

Lesson 6.2.1

6-95. $y = 3^x$

6-96. In $2 = 1.04^x$ the variable is the exponent, but in $56 = x^8$ the exponent is known so you can take the 8^{th} root.

6-97. $x > 100$, because $10^2 = 100$

6-98. Answers will vary.

6-99. **a:** $\frac{1}{8}$ **b:** $\frac{1}{x}$ **c:** $m \approx 1.586$ **d:** $n = 2.587$

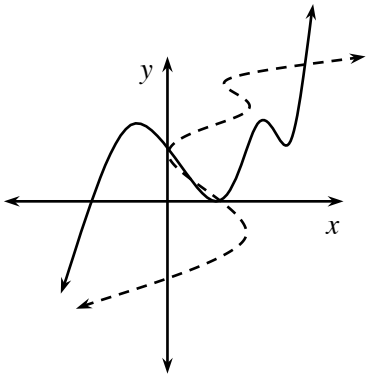
e: Answers will vary. $x = b^{1/a}$

6-100. $2^{1/2} = \sqrt{2}$ and $2^{-1} = \frac{1}{2}$

6-101. **a:** $-3 < x < 3$ **b:** $-2 < x < 1$ **c:** $x \le -2$ or $x \ge 1$

6-102. **a:** Yes

b: See graph at right, (it is not a function).



c: Not necessarily.

d: Functions that have inverse functions have no repeated outputs; a horizontal line can intersect the graph in no more than one place.

e: Yes; for example, a sleeping parabola is not a function, but its inverse is a function.

6-103. **a:** $x = -3, y = 5, z = 10$

b: There are infinitely many solutions.

c: The planes intersect in a line.

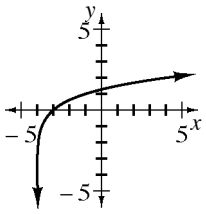
Lesson 6.2.2

6-113. **a:** 5.717 **b:** 11.228

6-114. **a:** $\frac{x^2}{x-1}$ **b:** $\frac{b+a}{a-a^2b}$

6-115. $\frac{\log_5 7}{\log_5 2}$

6-116. It is the $\log_3(x)$ graph shifted 4 units to the left. See graph at right.



6-117. 16.5 months; 99.2 months

6-118. They are correct. Vertex: (2.5, –23.75), line of symmetry: $x = 2.5$.

6-119. **a:** $f(x) = 4(x-1.5)^2 - 3$, vertex (1.5, –3), line of symmetry $x = 1.5$

b: $g(x) = 2(x+3.5)^2 - 20.5$, vertex (–3.5, –20.5), line of symmetry $x = –3.5$

6-120. **a:** Consider only $x \geq –2$ or $x \leq –2$.

b: Depending on the original domain restriction, $y = \sqrt{\frac{x+7}{3}} - 2$ or $y = -\sqrt{\frac{x+7}{3}} - 2$.

c: $x \geq –7$ and $y \geq –2$ or $x \geq –7$ and $y \leq –2$.

6-121. **a:** $\frac{6x-21}{x^2-3x-4}$ **b:** $\frac{5}{x^2-9}$

6-122. **a:** 20, 100, 500 **b:** $n = 7$

c: No, because there are no terms between the 6th term (62,500) and the 7th term (312,500).

Lesson 6.2.3

6-127. **a:** $y = 40(1.5)^x$

b: When $x = -9$, or 9 days before the last day of October (October 22).

6-128. Possible answer: $4^{(x+1)} = 6$

6-129. Answers will vary.

6-130. The graph should show a decreasing exponential function which will have an asymptote at room temperature.

6-131. $y = x^2 - 6x + 8$

6-132. **a:** $x \geq \frac{1}{2}$ and $y \geq 3$ **b:** $g(x) = \frac{(x-3)^2+1}{2}$ **c:** $x \geq 3$ and $y \geq \frac{1}{2}$

d: x **e:** x (They are the same, because f and g are inverses.)

6-133. **a:** $x \approx 6.24$ **b:** $x = 5$

6-134. **a:** $(x-1)^2 + y^2 = 9$ **b:** $(x+3)^2 + (y-4)^2 = 4$

6-135. **a:** $x + 5$ **b:** $a + 5$ **c:** $x - y$ **d:** $\frac{x^2+1}{x^2-1}$

6-136. **a:** $p^{-1}(x) = \sqrt[3]{(\frac{x}{3} - 6)}$ **b:** $k^{-1}(x) = \sqrt[3]{(\frac{x-6}{3})}$

c: $h^{-1}(x) = \frac{x+1}{x-1}$ **d:** $j^{-1}(x) = \frac{3x-2}{x} = -\frac{2}{x} + 3$

Lesson 6.2.4

6-138. **a:** Decreasing by 20% means you multiply by 0.8 each time, and the presence of a multiplier implies exponential.

b: $y = 23500(0.8^x)$ **c:** \$9625.60

d: ≈6.12 years **e:** \$42,926.44

6-139. **a:** $x = \frac{1}{2}$ **b:** any number except 0 **c:** $x = 10^{23}$

6-140. **a:** $x = 2.236$ **b:** $x = 4.230$ **c:** $x = 0.316$

d: $x = 2.021$ **e:** $x = 3.673$

6-141. **a:** 16 **b:** 12 **c:** $12^4 = 20736$ **d:** 54

e: No, they are not inverses (if they were, then the answers to parts (c) and (d) would have to be 2).

6-143. $c(x) = x^2 - 5$

6-144. $x = 17$

6-145. **a:** $\frac{2(x+1)}{x+3}$ **b:** $\frac{3x^2-5x-3}{(2x+1)^2}$

6-146. **a:** 30° **b:** 22.6°

6-147. $y \leq -\frac{3}{4}x + 3, y \geq -\frac{3}{4}x - 3, x \leq 3, x \geq -3$