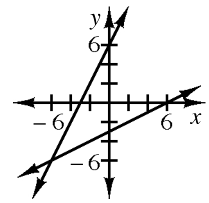
Lesson 5.1.1

5-8. **a:** The inputs and outputs are switched.

b: See graph at right.

c: $y = 2(x + 3)$

d: Yes, $y = x$.



5-9. **a:** 9 **b:** $x = 4$ **c:** $x \approx 1.89$

5-10. Answers will vary, but it should have an "L" shape to it. In the middle there would probably not be any armrests to cut through.

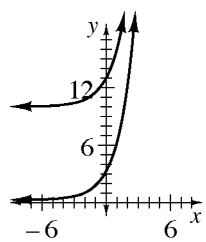
5-11. **a:** no solution **b:** $x = \frac{8}{3}$ **c:** $x \approx 3.17$ **d:** $x = 2$

e: $x = \frac{13}{3}$

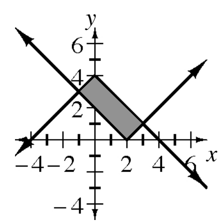
5-12. **a:** $T(x) = 3(2)^x$

b: $C(x) = 3(2)^x + 10$

c: The graph for Clifton is the same as the graph for Tasha shifted up 10 units.



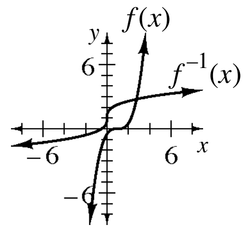
5-13. See graph at right. 6 sq. units



5-14. The multiplier 1.083 represents a growth rate of 8.3%; for example, the average cost of a ticket will go up 8.3% a year, where t is the number of years.

Lesson 5.1.2 Day 1

5-25. See graph at right.



5-26. **a:** $f^{-1}(x) = \frac{1}{3}(x+8)$

b: $f^{-1}(x) = 2(x-6)$

c: $f^{-1}(x) = 2x-6$

5-27. Not necessarily if the rectangle's sides are not parallel or perpendicular to the axis of rotation, or the rectangle is not touching the line.

5-28. **a:** $a = 3, b = \pm 5$

b: $a = 2, b = 3$

5-29. **a:** $L(x) = x^2 - 1$; $R(x) = 3(x + 2)$

b: 30

c: Order does matter. $R(3) = 15$ and $L(15) = 224$, so an input of 3 in the changed order did not result in an output of 30.

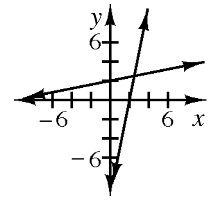
5-30. $(x + 2)^2 + (y - 3)^2 = 4r^2$

5-31. $y \le -\frac{3}{4}x + 3$, $y \ge -\frac{3}{4}x - 3$, $x \le 3$, $x \ge -3$

Lesson 5.1.2 Day 2

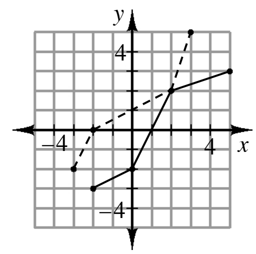
5-32. $y = \frac{x}{5} + 2$

See graph at right.



5-33. It does not matter which graph is labeled as the function or the inverse; $h^{-1}(x)$ is the inverse of $h(x)$, and $h(x)$ is the inverse of $h^{-1}(x)$.

5-34. See graph at right. For $f(x)$, domain: $-2 \le x \le 5$, range: $-3 \le y \le 3$; For $f^{-1}(x)$, domain: $-3 \le x \le 3$, range: $-2 \le y \le 5$. The domain and range are switched.



5-35. One way would be to sweep a rectangle only about 45° rather than to revolve it completely. Then the piece will only be a wedge.

5-36. **a:** normalcdf(70, 79, 74, 5) ≈ 0.629, About 63% would be considered average.

b: normalcdf(–10^99, 66, 74, 5) ≈ 0.055, About 5 to 6% of them would be in excellent shape.

c: normalcdf(–10^99, 66, 70, 5) – 0.0548 from part (b) ≈ 0.157; There would be a nearly 16% increase in women her age who are classified as being in excellent shape.

5-37. **a:** horizontal shift right if $t > 0$, horizontal shift left if $t < 0$

b: vertical stretch for $|t| > 1$, vertical compression for $|t| < 1$, reflection if $t < 0$.

5-38. **a:** $\sqrt{-3} \cdot \sqrt{-3} = i\sqrt{3} \cdot i\sqrt{3} = i^2\sqrt{9} = -3$

b: She multiplied $\sqrt{-3} \cdot \sqrt{-3}$ to get $\sqrt{9} = 3$.

c: $\sqrt{-3}$ is undefined in relation to real numbers, and is only defined as the imaginary number $i\sqrt{3}$, so it must be written in its imaginary form before operations such as addition or multiplication can be performed.

d: a and b must be non-negative real numbers.

Lesson 5.1.3

5-45. Trejo is correct, as long as the domains are restricted appropriately.

5-46. **a:** 121 **b:** 17

5-47. **a:** 3 **b: 5** **c:** 4 **d:** $\frac{1}{2}$ **e:** $\frac{1}{4}$

f: $\frac{1}{6}$ **g:** $\frac{1}{2}$ **h:** 4 **i:** a

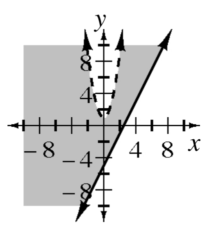
5-48. **a:** Square 9 and subtract 5; Caleb dropped in 76.

b: $k^{-1}(x) = x^2 - 5$

5-49. Remembering that lower times are better, for David: normalcdf(122, 10^99, 149, 13.6) ≈ 0.976; for Regina: normalcdf(130, 10^99, 145, 8.2) ≈ 0.966. David is relatively faster, but the difference is very small!

5-50. One possible solution method is $5x + 8x + 56 = 160$. $x = 8$. Or, the two missing sides must have total length 104 cm. Since the ratio is 5:8 with no broken rods, there must be some multiple of 5 + 8 = 13 number of rods that makes up the two missing sides. Since 13 · 8 = 104, the rods could be 8 cm long. The three sides of the tail fin are 56, 40, and 64 cm. If the rods were, say 4 inches or 2 inches long, the length of the sides would still be the same.

5-51.



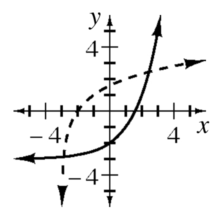
Lesson 5.2.1

5-56. Domain: $x > 0$; Range: $-\infty < y < \infty$; x-intercept: $(1, 0)$; no y-intercept; asymptote at $x = 0$, increasing, continuous function

5-57. **a:** $b = 3, 3^5 = 243$ **b:** $b = 10, 10^{-3} = 0.001$

5-58. Yes, it is possible. Make the slice at the apex so the cross-section is a point or slice at an angle.

5-59. See solid curve on graph at right.



a: domain: all real numbers; range: $y > -3$

b: no

c: $(0, -2)$, $(\approx 1.585, 0)$

d: See dashed curve on graph at right. domain: $x > -3$; range: all real numbers; $(0, \approx 1.585)$, $(-2, 0)$

5-60. The yield of the Amazing Apples tree was $\frac{940-840}{120} = 0.83$ standard deviations above the mean, while the Amazing Mango tree was only $\frac{400-350}{190} = 0.26$ standard deviations above the mean. Put another way, the Amazing Apple tree was at normalcdf(–10^99, 940, 840, 120) ≈ 79.8 percentile, while the Amazing Mango tree was at normalcdf(–10^99, 400, 350, 190) ≈ 60.4 percentile. The Amazing Apples fertilizer appears to be more amazing based on this one sample.

5-61. **a:** $(x + 2)^2 + (y - 13)^2 = 144$

b: $(x + 1)^2 + (y + 4)^2 = 1$

c: $(x - 3)^2 + (y + 8)^2 = 16$

5-62. **a:** $g(f(x)) = 3((x^2 - 1) + 2)$ or $3x^2 + 3$

b: $f(g(x)) = (3(x + 2))^2 - 1$ or $9x^2 + 36x + 35$

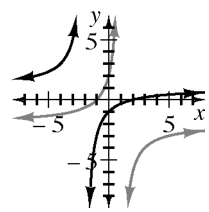
Lesson 5.2.2

5-68. $x = 2^y$; The two equations do not look the same, but they are equivalent. They have the same graph or give the same table, or one is just a rewritten equation of the other.

5-69. **a:** $x = \log_5(y)$ **b:** $x = 7^y$ **c:** $x = \log_8(y)$

d: $K = \log_A(C)$ **e:** $C = A^K$ **f:** $K = \left(\frac{1}{2}\right)^N$

5-70. **a:** See graph and tables at right. $x \neq -2$ for the original function, which means $y \neq -2$ for the inverse function. $x \neq -1$ for the inverse function (because $y \neq 1$ in the original function).



x	$f(x)$
–4	3
–3	5
–2	undef.
–1	–3
0	–1
1	–0.3
2	

x	$f^{-1}(x)$
–3	–1
–2	–0.6
–1	0
0	2
1	undef.
2	–6
3	–4

b: $f^{-1}(x) = \frac{-2x-2}{x-1}$ or $f^{-1}(x) = \frac{-4}{x-1} - 2$

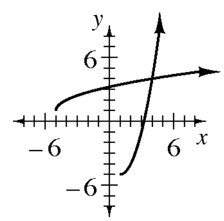
5-71. **a:** $x \geq -5$

b: $e^{-1}(x) = (x-1)^2 - 5$; $x \geq 1$

c: $e^{-1}(e(-4)) = -4$ because one machine undoes the other.

d: They would be reflections of each other across the line $y = x$.

e: See graph at right.



5-72. The parent graph is $y = x^2$. The graph of $y = f(x)$ is reflected over the x-axis to open downward, stretched vertically by a factor of 2, and then translated 1 unit right and 3 units up to have a vertex at (1, 3).

5-73. $\frac{6}{7}$

5-74. $x = -7, y = 11$

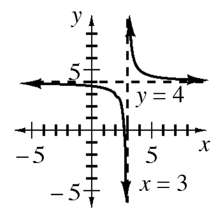
Lesson 5.2.3

5-78. $y = \log_7(x)$

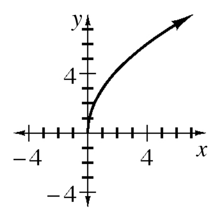
5-79. 11. The problem is asking for the exponent for base 6 that will give 6 to the 11th power. That is similar to Jonique's question because the answer is stated in the question.

5-80. The first would produce two separate circles as the cross-section. The second would produce a ring.

5-81. **a:** hyperbola with parent graph $y = \frac{1}{x}$, translated right 3 units and up 4 units



b: square root graph with parent graph $y = \sqrt{x}$, stretched vertically by a factor of 3



c: $y = 2x^2 - 3$

d: $y = -(x - 1)^3 + 4$

5-82. **a:** normalcdf(–10^99, 59, 63.8, 2.7) ≈ 0.0377; 3.77%

b: (0.0377)(324)(half girls) = 6 girls

c: normalcdf(72, 10^99, 63.8, 2.7) ≈ 0.00119. (0.00119)(324)(half) ≈ 0.19 girls; We would not expect to see any girls over 6 ft tall. This assumes that the senior girls at North City High are a representative sample of women in the United States.

d: It is likely that there will be girls over 6 ft tall, and the senior girls are probably not a representative sample of women in the U.S.

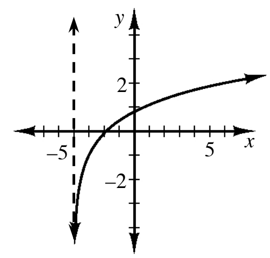
5-83. **a:** $x \approx 6.24$ **b:** $x = 5$

5-84. **a:** –102 **b:** –7 **c:** $x = \pm\sqrt{\frac{c+4}{-2}}$, $c \le -4$

d: $x = \frac{c-3}{5}$ **e:** $g^{-1}(x) = \frac{x-3}{5}$

Lesson 5.2.4

5-89. **a:** $x = 25$ **b:** $x = 2$ **c:** $x = 343$
d: $x = \sqrt{3}$ **e:** $x = 3$ **f:** $x = 4$



5-90. See graph at right.

5-91. No; $\log_3 2 < 1$ and $\log_2 3 > 1$

5-92. **a:** 12 because $12^{0.926628408}$ is very close to 10.

b: Answers vary, but 12 fingers make sense for base 12.

5-93. A bit like a Bundt cake form.

5-94. Sample answer: Yes, because if the numbers are the same, the exponent you have used to get them is the same, given the same base.

5-95. **a:** Domain of $f(x)$ is $x \le 7$ and range is $f(x) \ge -6$.
For $f^{-1}(x)$, switch them: domain of $f^{-1}(x)$ is restricted to $x \ge -6$ and range is $f(x) \le 7$.

b: $f^{-1}(f(a)) = a$

