1. common

2. log base 3 of 9

3. They are inverse equations.

4. Evaluate 4^2; 16; 2

5. $3^2 = 9$

6. $4^1 = 4$

7. $6^0 = 1$

8. $7^3 = 343$

9. $\left(\frac{1}{2}\right)^{-4} = 16$

10. $3^{-1} = \frac{1}{3}$

11. $\log_6 36 = 2$

12. $\log_{12} 1 = 0$

13. $\log_{16} \frac{1}{16} = -1$

14. $\log_5 \frac{1}{25} = -2$

15. $\log_{125} 25 = \frac{2}{3}$

16. $\log_{49} 7 = \frac{1}{2}$

17. 4

18. 2

19. 1

20. 0

21. -4

22. -3

23. -1

24. -3

25. $\log_7 8, \log_5 23, \log_6 38, \log_2 10$

26. There is no power of 2 that gives you -1, and all powers of 1 give you 1.

27. 0.778

28. 2.485

29. -1.099

30. -0.544

31. -2.079

32. 0.778

33. 4603 m

34. **a.** 8
b. 3

35. x

36. $5x$

37. 4

38. 15

39. $2x$

40. $x + 1$

41. -3 and $\frac{1}{64}$ are in the wrong position; $\log_4 \frac{1}{64} = -3$

42. 16 should also be raised to the power of x;

$$\log_4 64^x = \log_4(16^x \cdot 4^x) = \log_4((4^2)^x \cdot 4^x) = \log_4(4^{2x} \cdot 4^x)$$
$$= \log_4(4^{2x+x}) = \log_4(4^{3x}) = 3x$$

43. $y = \log_{0.3} x$

44. $y = \log_{11} x$

45. $y = 2^x$

46. $y = \left(\frac{1}{5}\right)^x$

47. $y = e^x + 1$

48. $y = \frac{1}{2}e^x$

49. $y = \frac{1}{3}\ln x$

50. $y = \ln x + 4$

51. $y = \log_5(x + 9)$

52. $y = 10^{x-13}$

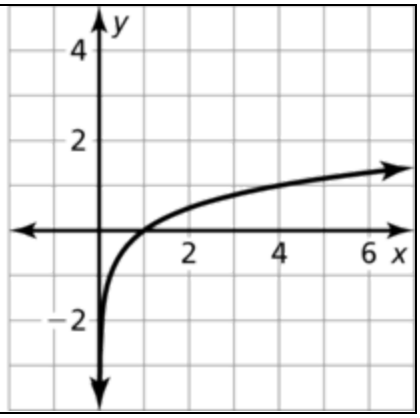
53. **a.** about 283 mi/h

b. $d = 10^{(s-65)/93}$; The inverse gives the distance a tornado will travel given the wind speed, s.

54. **a.** 9

b. $E = 10^{3/2(M+9.9)}$; The inverse gives the amount of energy released from an earthquake of magnitude M.

55.



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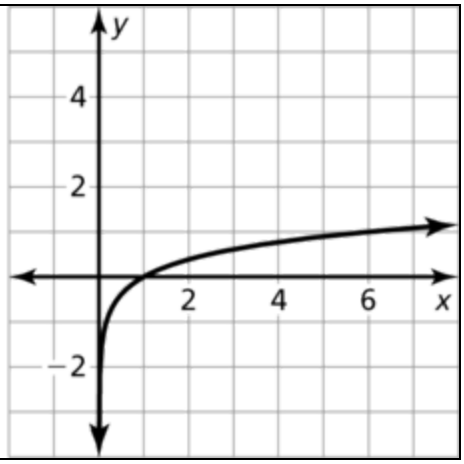

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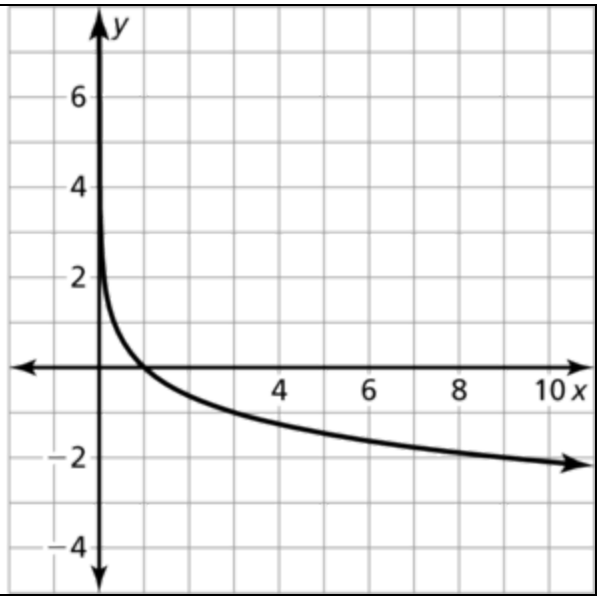

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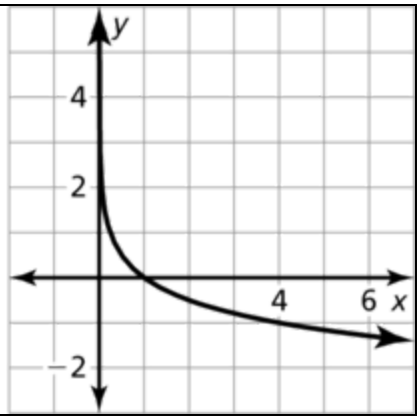

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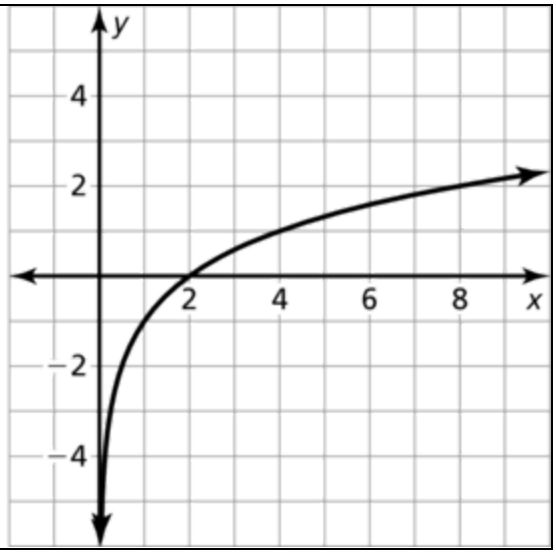

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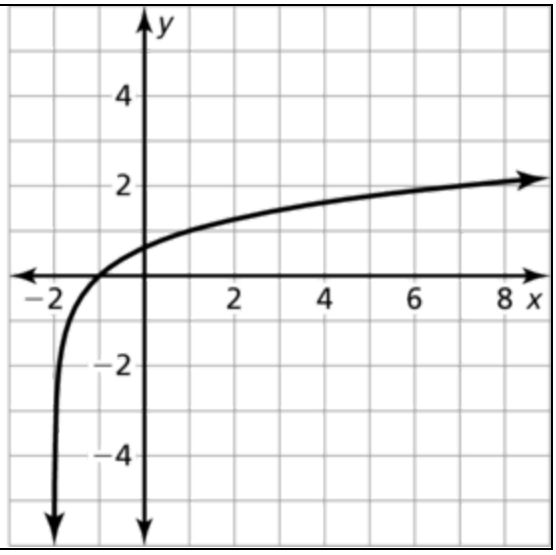

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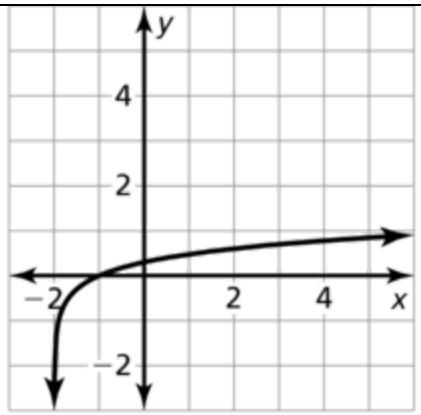
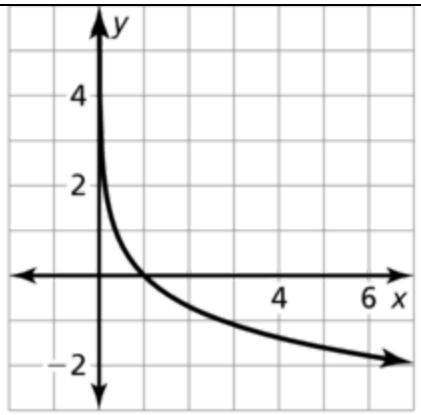


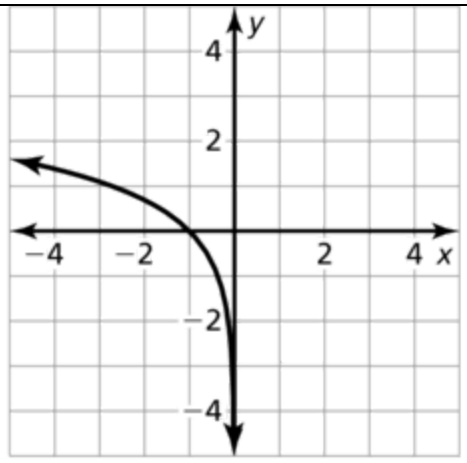
domain: $x > -2$, range: all real numbers, asymptote: $x = -2$

62.



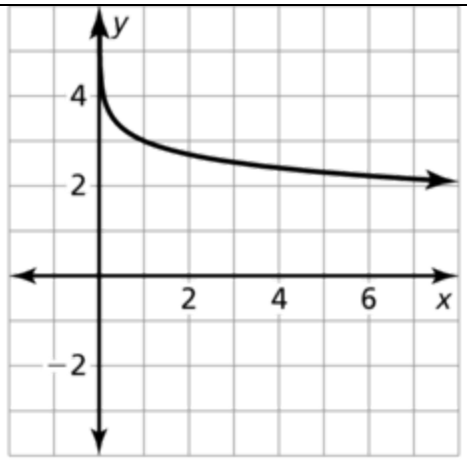
domain: $x > 0$, range: all real numbers, asymptote: $x = 0$

63.



domain: $x < 0$, range: all real numbers, asymptote: $x = 0$

64.

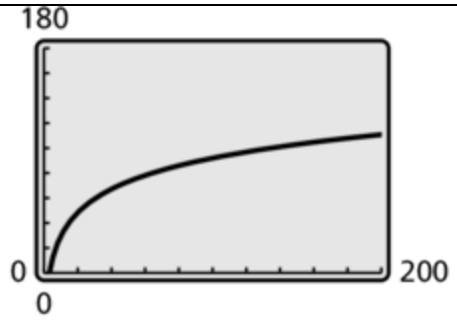


domain: $x > 0$, range: all real numbers, asymptote: $x = 0$

65. no; Any logarithmic function of the form $g(x) = \log_b x$ will pass through (1, 0), but if the function has been translated or reflected in the x-axis, it may not pass through (1, 0).

66. b, c, a, d

67. **a.**



b. about 281 lb

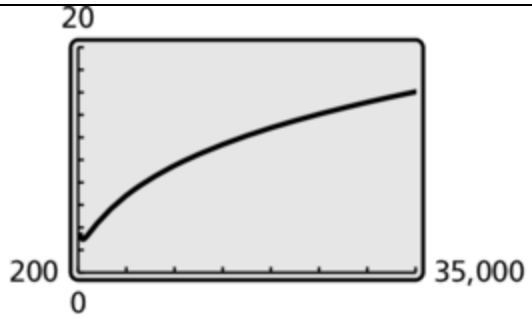
c. (3.4, 0); no; The x-intercept shows that an alligator with a weight of 3.4 pounds has no length. If an object has weight, it must have length.

68. **a.** As $x \to -\infty$, the exponential function approaches 0. The logarithmic function is not defined for $x \leq 0$. As $x \to \infty$, the exponential function approaches ∞ and the logarithmic function approaches ∞.

b. yes; They are symmetric in the line $y = x$.

c. The base of each function is 6; The logarithmic function passes through the point (6, 1). So, the equation for function g is $y = \log_6 b$. Graphing this function and $y = 6^x$ in your graphing calculator produces the same graphs as the ones shown.

69. **a.**

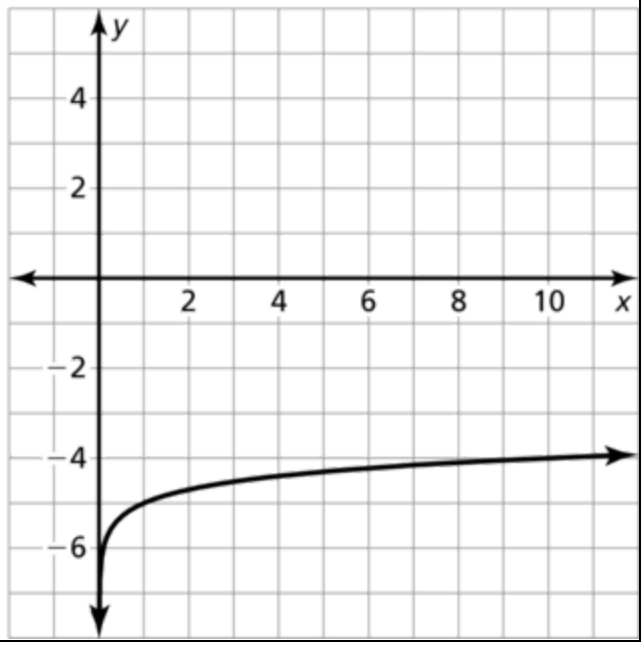


b. 15 species

c. about 3918 m^2

d. The number of species of fish increases; *Sample answer:* This makes sense because in a smaller pool or lake, one species could dominate another more easily and feed on the weaker species until it became extinct.

70. *Sample answer:* $y = \log(x) - 5$



71. **a.** $\frac{2}{3}$

b. $\frac{5}{3}$

c. $\frac{4}{3}$

d. $\frac{7}{2}$

72. $g(x) = -\sqrt[3]{x}$

73. $g(x) = \sqrt[3]{\frac{1}{2}x}$

74. $g(x) = \sqrt[3]{-x} + 3$

75. $g(x) = \sqrt[3]{x + 2}$

76. constant; The graph is a translation 3 units down of the parent constant function.

77. quadratic; The graph is a translation 2 units left and 1 unit down of the parent quadratic function.

78. absolute value; The graph is a reflection in the x-axis followed by a translation 1 unit right and 2 units up of the parent absolute value function.