****(4-2a) Solve each of the following situations.****

13) Castel invests $8,296 in a retirement account with a fixed annual interest rate of 5% compounded continuously. What will the account balance be after 19 years?

14) Darryl invests $1,923 in a savings account with a fixed annual interest rate of 3% compounded 6 times per year. What will the account balance be after 8 years?

15) Pranav invests $7,515 in a retirement account with a fixed annual interest rate of 9% compounded continuously. How long will it take for the account balance to reach $45,463.10?

16) Emily invests $8,173 in a savings account with a fixed annual interest rate of 7% compounded 6 times per year. How long will it take for the account balance to reach $10,796.43?

17) The worldwide population of gorillas is decreasing at a rate of 12% each year. The population is currently 10,500.

a) Write an equation to model the situation

b) How many gorillas will there be in 8 years?

c) How long until the population of gorillas reaches 2,000?

18) A house in American Fork is priced at $280,000 and appreciates at a rate of 2.2% each year.

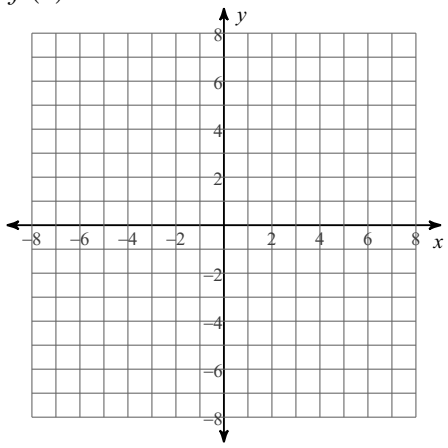
a) Write an equation to model the situation

b) How much will the house be worth in 5 years?

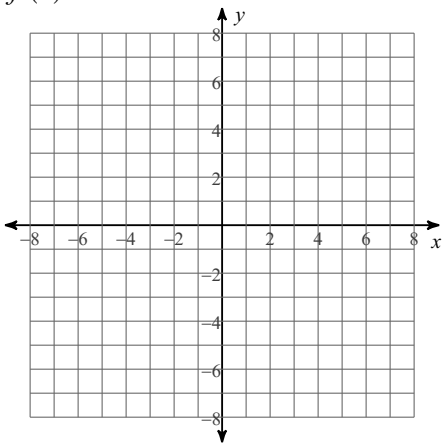
c) How long until the house will be worth $350,000?

****(4-3a) For each function, determine the transformations, y-intercept and horizontal asymptote. Then sketch the graph.****

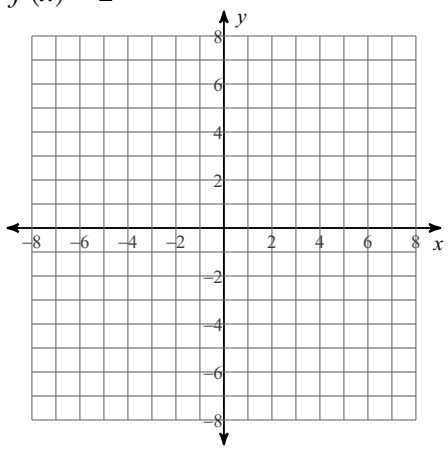
19) $f(x) = 2^{x-3} + 1$



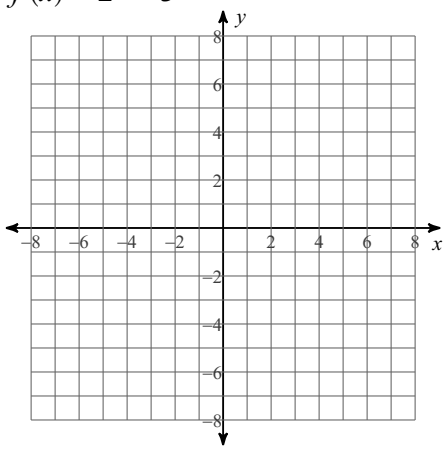
20) $f(x) = 5^{x-1} - 3$



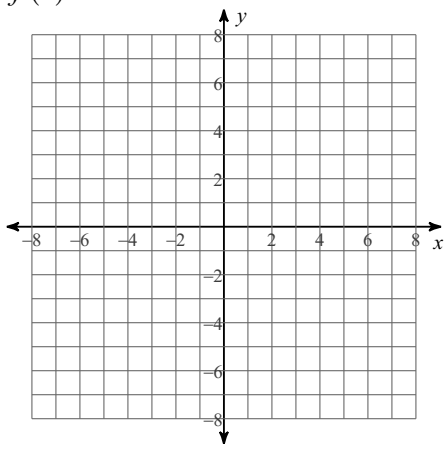
21) $f(x) = 2^{x+4}$



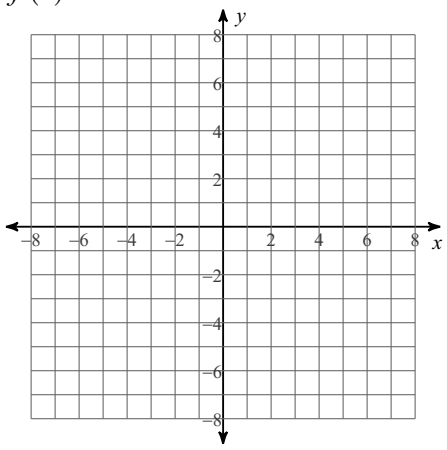
22) $f(x) = 2^{x} - 3$



23) $f(x) = -3^{x+2}$



24) $f(x) = -2^{x} - 4$



Rewrite each equation in exponential form.

25) $\log_3 243 = 5$

26) $\log_{11} b = 3$

27) $\log_n 100 = m$

28) $\log_b 61 = -18$

29) $\log_2 \frac{1}{32} = -5$

30) $\log_{19} 361 = 2$

Rewrite each equation in logarithmic form.

31) $121^{\frac{1}{2}} = 11$

32) $14^{m} = n$

33) $b^{-6} = a$

34) $20^{x} = y$

35) $2^{3} = 8$

36) $12^{2} = 144$

****(5-1a) Evaluate each expression.****

37) $\log_{3} \frac{1}{27}$

38) $\log_{5} 25$

39) $\log_{6} 1$

40) $\log_{7} \frac{1}{343}$

41) $\log_{7} \frac{1}{49}$

42) $\log_{2} 64$

43) $\log_{6} 36$

44) $\log_{7} 49$

45) $\log_{3} \frac{1}{81}$

46) $\log_{2} 16$

(5-2a) Evaluate each expression using logarithm properties

47) $\log_{7} 1$

48) $10^{\log 16}$

49) $\log_{4} 4^{y}$

50) $\log_{2} 2$

(5-2a) Expand each logarithm.

51) $\log_{2} \left(z^{3}\sqrt{x}\right)$

52) $\log_{2} \frac{u^{4}}{v^{4}}$

53) $\log_{2} \left(a \cdot b \cdot c^{5}\right)$

54) $\log_{2} \left(x^{2}y^{6}\right)$

55) $\log_6 \sqrt[3]{a \cdot b \cdot c}$

56) $\log_7 \left(z\sqrt{x \cdot y}\right)$

(5-2a) Condense each expression to a single logarithm.

57) $\log_7 x + \log_7 y + 5\log_7 z$

58) $6\log_4 u - 24\log_4 v$

59) $16\log_3 u - 4\log_3 v$

60) $10\log_3 u - 2\log_3 v$

61) $\ln a + \ln b + 4\ln c$

62) $12\log_2 u + 3\log_2 v$

****(5-3a) Solve each equation. Round answers to the nearest tenth.****

63) $9^n - 10 = 71$

64) $-10 + 10^v = 990$

65) $4 \cdot 4^k = 64$

66) $5^{2k-6} + 4 = 29$

67) $e^{-3k} - 5 = -4$

68) $8^{-7n-1} + 2 = 66$

69) $3^{x-3} - 5 = 22$

70) $5 \cdot 17^{p-8} = 85$

71) $\log x - 4 = -2$

72) $-3 + \log_6 x = -5$

73) $1 + \log_{11} p = -1$

74) $\log_{12} m - 3 = 0$

75) $3\log_2 r = 9$

76) $2\ln x = 4$

77) $-8 + \log_8 k = -10$

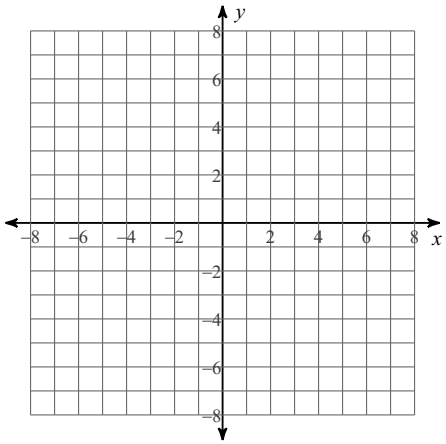
78) $-8\log_8 m = -16$

79) $\log_9 -2n - 11 = -10$

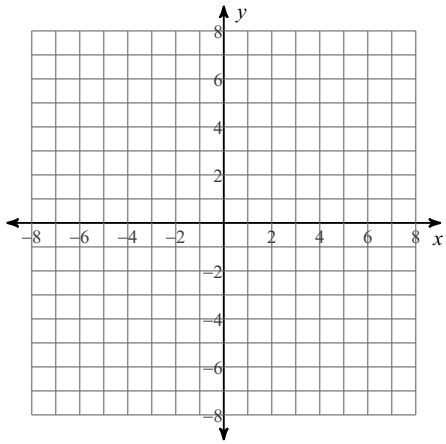
80) $9 + \log_{11} (2x - 3) = 11$

(5-4a, b, c) Identify the transformations, vertical asymptote and two points on the graph. Then sketch the graph.

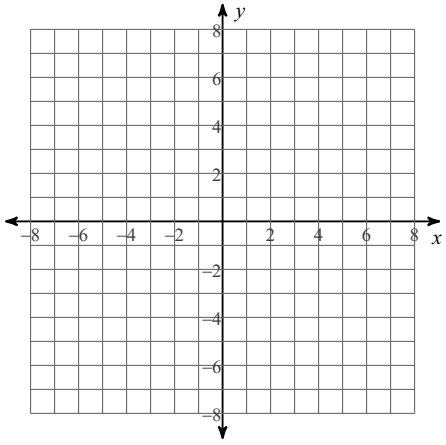
81) $f(x) = \ln(x - 1) + 5$



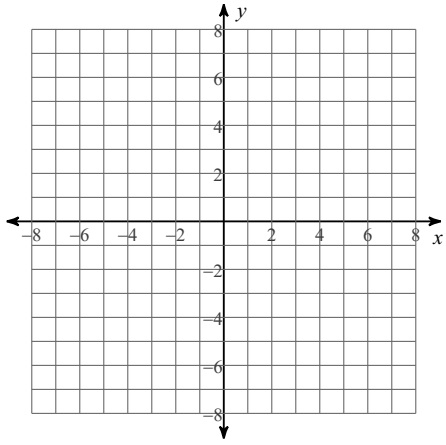
82) $f(x) = \log(x - 2) - 4$



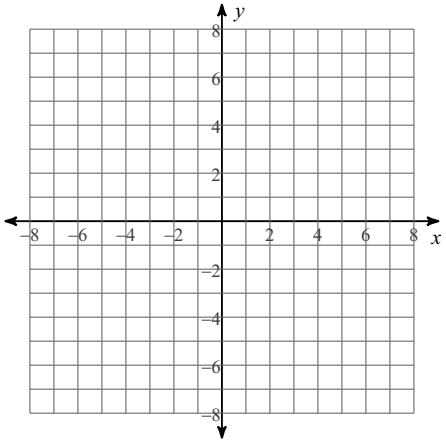
83) $f(x) = \log_4(x + 3) + 5$



84) $f(x) = \log_5(x + 5) - 2$



85) $f(x) = 2\log_4(x - 2)$



86) $f(x) = -\log_2 x + 2$