

Graph each function. State the domain and range of each function.

1) $y = 3^x$

2) $y = \left(\frac{1}{3}\right)^x$

3) $y = 2(3)^x$

4) $y = 2^{x+1} - 3$

5) $y = 5^{x-3} - 4$

6) $y = -3(4)^{x+4} + 2$

7) $y = \log_4 x$

8) $y = \log_2(x+5) - 3$

9) $y = \log_3(x+2)$

10) $y = \log_6(x+3) - 1$

Write each logarithm in exponential form.

11) $\log_2 8 = 3$

12) $\log 100 = 2$

13) $\ln x = y$

14) $\log_4 \frac{1}{16} = -2$

Write each exponential function in logarithmic form.

15) $10^{-1} = \frac{1}{10}$

16) $e^x = y$

17) $8^{\frac{1}{3}} = 2$

18) $6^2 = 36$

Evaluate each expression.

19) $\log_2 16$

20) $\log_8 2$

21) $\log_2 \frac{1}{4}$

22) $\log 10$

23) $\log_3 9$

24) $\log_{64} 2$

25) $\log_9 \frac{1}{81}$

26) $\ln(e^{10})$

27) $\log_5 5^{12}$

28) $\ln(e)$

29) $\ln 1$

30) $\log_3 1$

31) $\log_2 16 - \log_2 4$

32) $\log_8 2 + \log_8 32$

Expand each logarithm.

$$33) \log_6 \left(\frac{xy^3}{\sqrt{z}} \right)$$

$$34) \ln \left(\frac{2x}{y^3z} \right)^2$$

$$35) \log \sqrt[3]{\frac{ab}{c}}$$

$$36) \log_{12} \left(\frac{4x}{z^5} \right)$$

Condense each expression into a single logarithm.

$$37) \ln 6 + \ln x - \ln y$$

$$38) \log x - \frac{1}{2} \log y - \frac{1}{2} \log z$$

$$39) \log(x+1) - \log(x-2)$$

$$40) \log_7 x + \log_7(x-3)$$

Solve each equation without using a calculator.

$$41) 2^{2x+1} = 16$$

$$41) 9^{x-1} = \frac{1}{27}$$

$$41) 27^{x-2} = \frac{1}{81^{x+2}}$$

$$42) 4^{-3} = 8^{2x}$$

$$43) \log_2 2x = 4$$

$$44) \log(x-1) = 2$$

$$45) 2 \log_3(x-1) - 6 = -2$$

$$46) \log_2(2x-1) = \log_2(x+3)$$

$$47) \log_7(x^2 - 3) = \log_7(2x)$$

$$48) \log 5 - \log 2x = 1$$

$$49) \log(7x+1) - \log(x-2) = 1$$

$$50) \log_2 x + \log_2(x+2) = 3$$

#51-66 requires the use of a calculator. Round all answers to the nearest thousandths.

Solve each equation.

$$51) 4^x = 20$$

$$52) 2(3)^x - 1 = 6$$

$$53) 5^{3x+1} - 6 = 5$$

$$54) -3 \cdot 6^{x+1} - 2 = -6$$

$$55) e^x = 10$$

$$56) -4e^{4x+1} + 5 = -12$$

$$57) \ln(x-1) = 4$$

$$58) 2 \ln(2x-3) + 4 = 2$$

Answer each question.

- 59) At the birth of her son, Mrs. Carson invested \$10,000 into a bank account. This bank account has an interest rate of 6%, and is compounded **quarterly**.
- Write an equation to represent how much money will be in the account after t years.
 - How much will be in her son's account after 18 years?
 - How long would it take for the account to hit \$12,000
- 60) At the birth of her son, Mrs. Carson invested \$10,000 into a bank account. This bank account has an interest rate of 6%, and is compounded **continuously**.
- Write an equation to represent how much money will be in the account after t years.
 - How much will be in her son's account after 18 years?
 - How long would it take for the account to hit \$12,000
- 61) At the birth of her second son, Mrs. Carson invested \$7,000 into a bank account. This bank account has an interest rate of 1.2%, and is compounded **monthly**.
- Write an equation to represent how much money will be in the account after t years.
 - How much will be in her son's account after 18 years?
 - How long will it take for the account to hit \$8,000?
- 62) At the birth of her second son, Mrs. Carson invested \$7,000 into a bank account. This bank account has an interest rate of 1.2%, and is compounded **continuously**.
- Write an equation to represent how much money will be in the account after t years.
 - How much will be in her son's account after 18 years?
 - How long will it take for the account to hit \$8,000?
- 63) In the movie, Back To The Future, Doc Brown needed to get Plutonium from the Lybians in order to power his DeLorean. When Doc Brown put the 120 grams of Plutonium into the car, he didn't realize that it would decay at a rate of 35% an hour.
- Write an equation to express how much Plutonium will remain after N hours.
 - How many grams would be left after 4 hours?
 - How long will it take for there to be only 50 grams of Plutonium?
- 64) A long, long, time ago, in a galaxy far, far, away, a scientist came across some radioactive material. After further investigation, said scientist realized that this radioactive material was Uranium. Uranium decays at a rate of 1% an hour.
- Write an equation to express how much Uranium would be left after N hours.
 - How many grams would be left after 2 days?
 - If it is determined that it would take over 7 grams of Uranium to cause your death, how long would it take before you could play with the Uranium without dying?
- 65) In 1990, the cost of tuition at a state university was \$4300. The tuition increases at a rate of 2% each year.
- Write an equation to model the cost of tuition after n years.
 - How much would it cost to attend the university in 2015?
 - In what year will the tuition cost \$10000?
- 66) A species of extremely rare, deep water fish has an extremely long lifespan and rarely have children. Currently there are a total 821 of this type of fish and their growth rate is 2% each month.
- Write an equation to model how many fish there are after n months.
 - How many fish are there after 3 years?
 - When will the population of the fish be 1000?