

Name J Key

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Assuming all variables are positive, use properties of logarithms to write the expression as a sum or difference of logarithms or multiples of logarithms.

1) $\log_4(xy)$

1) _____

$\log_4 x + \log_4 y$

2) $\ln x^3 y^4$

2) _____

$3 \ln x + 4 \ln y$

Compute the exact value of the function for the given x-value without using a calculator.

3) $f(x) = \left(\frac{1}{5}\right)^x$ for $x = 3$

3) _____

$\frac{1}{125}$

Decide if the function is an exponential function. If it is, state the initial value and the base.

4) $y = 8.1^x$

4) _____

yes, initial = 1 base = 8.1

5) $y = 6^3$

5) _____

no!

Evaluate the logarithm. Show work for full credit

6) $\log_8 64$

6) _____

$8^x = 64$
 $x = 2$

Find the amount accumulated after investing a principal P for t years at an interest rate r.

7) $P = \$480$, $t = 6$, $r = 6\%$, compounded quarterly ($k = 4$)

$\$686.16$

$480 \left(1 + \frac{.06}{4}\right)^{4(6)}$

Find the exact solution to the equation.

8) $\log_8 x = 5$

8) _____

$$8^5 = x$$

9) $2 \ln(x-3) = 1$

9) _____

$$e^{\ln(x-3)} = e^{1/2}$$

$$x-3 = e^{1/2}$$

$$x = e^{1/2} + 3$$

Simplify the expression.

10) $\log_3 3^5$

10) _____

$$5$$

11) $e^{\ln 5}$

11) _____

$$5$$

Solve the equation by changing it to exponential form.

12) $\log_{10} x = 3$

12) _____

$$10^3 = x \quad 1000$$

Solve the equation.

13) $\log_6 x + \log_6(x-3) = 2$

13) _____

$$\log_6 x(x-3) = 2$$

$$x^2 - 3x = 36$$
$$x^2 - 3x - 36 = 0$$

$$\frac{3 \pm \sqrt{9 - 4(1)(-36)}}{2}$$

$$\frac{3 \pm \sqrt{153}}{2}$$

Solve the problem.

- 14) If x is the hydrogen ion concentration of a sample of water, then the pH of that water sample is $f(x) = -\log x$. If the pH of the water from one lake is 6.4 and the pH of the water from a second lake is 7.3, how many times greater is the hydrogen ion concentration of the second lake than the hydrogen ion concentration of the first lake? Round your answer to the nearest hundredth.

14) _____

$$7.3 - 6.4 = .9$$

$$10^{.9} = 7.94$$

- 15) How long must \$4200 be in a bank at 8% compounded annually to become \$10,576.31? (Round to the nearest year.)

15) _____

$$\frac{4200(1.08)^t}{4200} = \frac{10,576.31}{4200}$$

$$\ln 1.08^t = \ln 2.51817$$

$$\frac{t \ln 1.08 = \ln 2.51817}{\ln 1.08}$$

$$t = 12 \text{ years}$$

- 16) A cake is removed from an oven at 325 °F and cools to 150 °F after 25 minutes in a room 68 °F. How long will it take the cake to cool to 104 °F?

16) _____

$$104 = 68 + (257)e^{-k(25)} \quad | \quad 150 = 68 + (325 - 68)e^{-k(25)}$$

$$36 = 257e^{-0.456943t}$$

$$\frac{82}{257} = \frac{257}{257}e^{-25k}$$

$$\ln\left(\frac{82}{257}\right) = \ln(e^{-25k})$$

$$\frac{\ln \frac{82}{257}}{-25} = \frac{-25k}{-25}$$

$$\ln\left(\frac{36}{257}\right) = \ln(e^{-0.456943t})$$

$$-0.456943$$

$$\approx 43 \text{ min}$$

$$k = .0456943$$

$$1.2123$$

Use the change of base rule to find the logarithm to four decimal places.

- 17) $\log_8 12.44$

17) _____

$$\frac{\ln 12.44}{\ln 8} = 1.2$$

Write the expression using only the indicated logarithms.

- 18) $\log_3 x$ using natural logarithms

18) _____

$$\frac{\ln x}{\ln 3}$$

