

Logarithms

Laws of logarithms:

1. if $\log_a(x) = y$ then $a^y = x$
2. $\log_a x = \frac{\ln x}{\ln a}$, $\log_e x = \ln x$
3. $\ln(e^x) = x$, $\ln e = 1$
4. if $\ln x = y$, then $e^y = x$
5. $\log_a(xy) = \log_a x + \log_a y$
6. $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$
7. $\log_a x^r = r \log_a x$

1. Using the laws of logarithms, what are the following equivalent to?

a. $\log_b(x) - \log_b(y) =$ b. $\log_b(u) + \log_b(v) =$

c. $\log_a y^2 + \log_a x^3 =$ d. $\log_a y^3 + \log_a x^4 =$

e. $\ln(e) =$ f. $\ln a + \frac{1}{2} \ln b =$

g. $2 \ln 4 - \ln 2 =$ h. $\ln x + a \ln y - b \ln z =$

2. Solve the following for x using known logarithm properties.

a. $\ln x = 2$ b. $\ln x = -1$

c. $\ln x = 5$ d. $13^x = 6$

e. $7 = 2^x$ f. $9^x = 4$

$$\text{g. } e^{5-3x} = 10$$

$$\text{h. } (2-\ln x)\ln x = 0$$

$$\text{i. } 2\ln x = 1$$

$$\text{j. } e^{-x} = 5$$

$$\text{k. } e^{2x+3} - 7 = 0$$

$$\text{l. } \ln(5 - 2x) = -3$$

$$\text{m. } 2^{x-5} = 3$$

$$\text{n. } \ln x + \ln(x-1) = 1$$

3. Find the value of each expression.

$$\text{a. } \log_2 64 =$$

$$\text{b. } \log_6 \frac{1}{36} =$$

$$\text{c. } \log_8 2 =$$

$$\text{d. } \ln e^{\sqrt{2}} =$$

$$\text{e. } \log_{10} 1.25 + \log_{10} 80 =$$

$$\text{f. } \log_5 10 + \log_5 20 - 3\log_5 2 =$$

$$\text{g. } 2^{(\log_2 3 + \log_2 5)} =$$

$$\text{h. } e^{3\ln 2} =$$