...an only evaluate logarithms with base 10 or e. The answers are often irrational numbers.
...: Evaluate using a calculator. Round to 3 decimal places.

...log 17 1.230

Q. $\ln 17$ 2.833

R. $\log(-1)$ not real

For logarithms with bases other than 10 and e, you can use change of base to evaluate them on the calculator.

Change of Base Property: $\log_b x = \frac{\log x}{\log b}$ or $\log_b x = \frac{\ln x}{\ln b}$

Examples: Evaluate each log using a calculator.

S. $\log_4 12$ $\frac{\log 12}{\log 4}$ 1.792

T. $\log_{20} 26.3$ $\frac{\log 26.3}{\log 20}$ 1.091

U. $\log_5 125$ $\frac{\log 125}{\log 5}$ 3

Properties of Logarithms

Product Property: $\log_b(mn) = \log_b m + \log_b n$

Quotient Property: $\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$

Examples: Expand each log expression

V. $\log_2(5xy)$ $\log_2 5 + \log_2 x + \log_2 y$

W. $\ln\left(\frac{a}{b+1}\right)$ $\ln a - \ln(b+1)$

X. $\log_3\left(\frac{pq}{6}\right)$ $\log_3 p + \log_3 q - \log_3 6$

Y. $\ln\left(\frac{w}{xy}\right)$ $\ln w - \ln x - \ln y$

Examples: Condense each log expression

Z. $\ln a + \ln b + \ln c$ $\ln(abc)$

a. $\log 5 - \log x - \log(y-4)$ $\log \frac{5}{x(y-4)}$

b. $\log_3 5 - \log_3 u + \log_3 6$ $\log_3 \frac{5(6)}{u} = \log_3 \frac{30}{u}$

Power Property: $\log_b(m^p) = p \cdot \log_b m$

Examples: Expand each log expression

c. $\log_5\left(\frac{x^3}{y^2}\right)$ $3\log_5 x - 2\log_5 y$

d. $\ln(a^5\sqrt{b})$ $b^{1/2}$ $5\ln a + \frac{1}{2}\ln b$

e. $\log_2 x^3y^5$ $3\log_2 x + 5\log_2 y$

Examples: Condense each log expression

f. $2\ln x + \frac{1}{2}\ln(z+2)$ $\ln x^2\sqrt{2+z}$

g. $2\log 5 + \frac{1}{3}\log u - 4\log 3$ $\log \frac{5^2\sqrt[3]{u}}{3^4} = \log \frac{25\sqrt[3]{u}}{81}$

h. $3\log_2 x - \log_2 y$ $\log_2 \frac{x^3}{y}$