

Properties of Logarithms

Topics

- 1) Use the three new properties of logs.
- 2) Use the properties of logs to expand logarithmic expressions.
- 3) Use the properties of logs to condense logarithmic expressions.
- 4) Use the change-of-base formula to evaluate logs.

- 1) Use the three new properties of logs.

Log PropertiesExamples

$$\log_b(MN) = \log_b M + \log_b N$$

$$\log_b\left(\frac{M}{N}\right) = \log_b M - \log_b N$$

$$\log_b M^p = p \log_b M$$

- 2) Use the properties of logs to expand logarithmic expressions.

Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

- 1) $\log_{11}(11x)$

- 2) $\log\left(\frac{x}{100}\right)$

- 3) $\ln\left(\frac{e^5}{7}\right)$

- 4) $\log_b(yz^6)$

- 5) $\log_5\left(\frac{x+5}{x^2}\right)$

- 6) $\ln \sqrt[5]{ey}$

- 7) $\log\left[\frac{8x^2\sqrt[4]{3-x}}{3(x+3)^2}\right]$

Properties of Logarithms

3) Use the properties of logs to condense logarithmic expressions.

13) $\frac{1}{2}(\log_3 (r - 9) - \log_3 r)$

Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

8) $\frac{1}{6}(\log_8 x + \log_8 y)$

14) $\frac{1}{7}(\log_6 x + \log_6 y) - 5 \log_6 (x + 3)$

9) $3 \log_y 4 + \log_y 3$

15) $\frac{1}{2}[2 \ln (x + 5) - \ln x - \ln (x^2 - 6)]$

10) $4 \log_b x - \log_b y$

11) $\log_2 (x + 8) - \log_2 (x - 4)$

12) $\log_{10} 125 + \log_{10} 8$

6) $\log x + \log (x^2 - 64) - \log 7 - \log (x - 8)$

4) Use the change-of-base formula to evaluate logs.

$$\log_b M = \frac{\log M}{\log b} = \frac{\ln M}{\ln b} \quad \text{Example:}$$