

Properties of Logarithms — 6.5

Show $\log_a(u \times w) = \log_a(u) + \log_a(w)$.

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$$\log_a\left(\frac{u}{w}\right) = \log_a(u) - \log_a(w)$$

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$$\ln\left(\frac{u}{w}\right) = \ln(u) - \ln(w)$$

$$\log_a(u^c) = c \log_a(u)$$

$$\log(u^c) = c \log(u)$$

$$\ln(u^c) = c \ln(u)$$

Examples

$$\log(10 \times 100) = \log(10) + \log(100)$$

$$\log_2\left(\frac{16}{4}\right) = \log_2(16) - \log_2(4)$$

$$\log_3(9^2) = 2 \log_3(9)$$

Express in terms of logs of x , y , or z .

1. $\ln \left(x^3 \sqrt{\frac{y^4}{z^5}} \right)$

Write the expression as one logarithm.

2. $5 \log_a x - \frac{1}{2} \log_a (3x - 4) - 3 \log_a (5x + 1)$

3. $2 \ln x - 4 \ln \left(\frac{1}{y} \right) - 3 \ln (xy)$

Solve each equation.

4. $5 \log_2 x = 2 \log_2 5$

5. $\log x - \log (x - 15) = 2$

6. $\ln 3x = 3 + \ln(x - 2)$