

5.5 Properties of Logarithms

Properties of Logarithms

If x , y , and $b > 0$, then

$$\log_b(xy) = \log_b x + \log_b y$$
$$\log_b \frac{x}{y} = \log_b x - \log_b y$$
$$\log_b x^k = k \log_b x$$

Examples

Expand the expression. If possible, write your answer without exponents.

- $\ln \frac{xy}{z}$
- $\log_2 \frac{32}{xy^2}$
- $\log \sqrt{\frac{xy^2}{z}}$
- $\log \left(\frac{2x-1}{5xy} \right)$

Examples

Write the expression as a logarithm of a single expression.

1. $\log_6 45 + 3 \log_6 b$

2. $\log_3 x + \frac{1}{2} \log_3 (x+3) - \frac{1}{3} \log_3 (x-4)$

Change of Base Formula

Let x , $a \neq 1$, and $b \neq 1$ be positive real numbers. Then

$$\log_a x = \frac{\log_b x}{\log_b a}$$

Example: Evaluate $\log_6 0.77$
