

5.5 Properties of Logarithms

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Properties of Logarithms

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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

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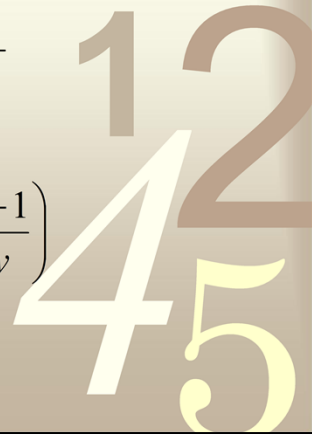
Expand the expression. If possible, write your answer without exponents.

1. $\ln \frac{xy}{z}$

2. $\log_2 \frac{32}{xy^2}$

3. $\log \sqrt{\frac{xy^2}{z}}$

4. $\log \left(\frac{2x-1}{5xy} \right)$



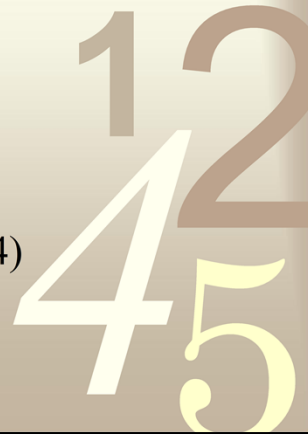
Examples

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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

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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 $\log_6 0.77$

