

4.3 LOGARITHMIC LAWS

1. Product Rule: $\log_b AB = \log_b A + \log_b B$

$$\log_3 2 + \log_3 9 =$$

$$\log_4 8 + \log_4 2 =$$

$$\log 2400 =$$

2. Quotient Rule: $\log_b \frac{A}{B} = \log_b A - \log_b B$

$$\log 12 - \log 3 =$$

$$\log_3(x^2 - 1) - \log_3(x + 1) =$$

3. Power Rule: $\log_b A^n = n \log_b A$

$$\log_4 64 =$$

$$\log_4 3x^5 y^2 =$$

Extension: $\log_b \sqrt[n]{A^m} = \log A^{\frac{m}{n}} = \frac{m}{n} \log_b A$

4. Change In Base: $\log_b C = \frac{\log_a C}{\log_a b}$

Example:

5. $b^{\log_b c} = c$

$3^{\log_3 4} =$

$9^{\log_3 5} =$

Evaluate:

1. $\log 0.001 =$

2. $\log_9 \sqrt[3]{9} =$

3. $\log_4 4^5 =$

4. $\log_{\frac{1}{4}} \frac{16^2}{2^{-3}} =$

6. Expand $\log_3 \frac{5x^4}{y^2} =$

Condense the logarithms:

7. $\frac{1}{2} \log_3 x - 2 \log_3 4 =$

8. $\log 5 - 2 \log x + 3 \log(x^2 + 5) =$

Helpful Rules: $\log_a b = \frac{1}{\log_b a}$ $\log_{b^n} a = \frac{1}{n} \log_b a$

Examples:

9. $12 \log_9 y - 24 \log_{27} y =$

10. $\frac{1}{\log_3 12} + \frac{1}{\log_4 12}$