

VI. More Properties of Logarithms: (Expand & Condense)

1) Product property: $\log_b m + \log_b n = \log_b (mn)$
2) Quotient Property: $\log_b m - \log_b n = \log_b \frac{m}{n}$
3) Power property: $\log_b m^n = n \log_b m$
4) Property of equality: if $\log_b m = \log_b n$, then $m = n$

Condense as a single logarithm: ****Used to solve equations****

1) $3\log_3 x + \log_3 y$

2) $\frac{1}{3}\ln x + 5\ln(x-3)$

Hint:

1. #log \rightarrow exponent
2. addition \rightarrow multiplication
3. subtraction \rightarrow division

3) $2\log_4 x + \log_4 3 - \log_4 y$

4) $\frac{1}{5}[\log_3 x + \log_3(x-2)] - \log_3 x$

Expand each logarithmic expression.

1) $\log_4 5x^3 y$

2) $\ln \frac{\sqrt{3x-5}}{7}$

Hint:

1. division \rightarrow subtraction
2. multiplication \rightarrow addition
3. exponent \rightarrow #log

3) $\ln \frac{x^2-1}{x^3}$

4) $\log_2 \frac{\sqrt{xy^4}}{z^4}$

Solve each equation:

1. $\log_3(4x) + \log_3 x = \log_3 144$

2. $\log(x^2 + 36) = \log 100$

3. $\log_6 x - \log_6 3 = 2$

4. $\log_5(4x) + \log_5 x = \log_5 100$

5. $\log_5(x^2 - 25) - \log_5(x - 5) = 2$

6. $\log_3(x+1) - \log_3 x = \log_3 4$

7. $\log_7(x-5) + \log_7(x+1) = 1$

8. $\ln x - \ln 2 = 0$