18.3 – Properties of Logarithms

For any positive numbers, M, N, and b, $b \neq 1$,	
Product Property	$\log_b MN = \log_b M + \log_b N$
Quotient Property	$\log_b \frac{M}{N} = \log_b M - \log_b N$
Power Property	$\log_b M^x = x \log_b M$

Write each logarithmic expression as a single logarithm.

1. $\log_3 20 - \log_3 4$

$\log_3 \frac{20}{4}$

$\log_3 5$

2. $\log_5 2 + \log_5 6$

$\log_5 2 \cdot 6$

$\log_5 12$

3. $3 \log_{10} x$

$\log_{10} x^3$

4. $3 \log_2 4 - 3 \log_2 2$

$\log_2 4^3 - \log_2 2^3$

$\log_2 \frac{4^3}{2^3}$

Expand each logarithmic expression.

5. $\log_5 \frac{x}{y}$

$\log_5 x - \log_5 y$

6. $\log 3x^4$

$\log 3 + \log x^4$

$\log 3 + 4 \log x$