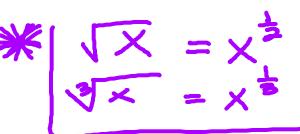
5-2 Rules of Logarithms

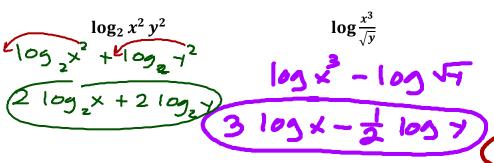
Name	Property	Examples
Zero Rule anything to 0 power = 0	$\log_a 1 = \bigcirc$	$\log_5 1 = \bigcirc$ $\ln 1 = \bigcirc$
Identity Rule "anythmy" to proceed in the control of the control o	$\log_a a =$	log ₄ 4 =
Inverse Properties if logs and exp have same bess		$\log_4 4^3 = 3$ $\ln e^{-0.5} = -0.5$
they undo each other		$5^{\log_5 20} = 20$ $e^{\ln 24} = 24$
Product Rule (*Cal): x²·x⁴=x²+⁴-x6	log _b MN =	$log_2 5 * 3 = log_3 5 + log_3 3$ $log 5w = log 5 + log \omega$ ln 6z = ln 6 + ln = 2
Quotient Rule **Call: **X*** **X***	$\log_b \frac{M}{N} = \log_b M - \log_b N$	$\log_{7} \frac{9}{x} = \log_{7} 1 - \log_{7} x$ $\ln \frac{p}{3} = \ln p - \ln 3$
Power Rule	$\log_b M^r = r \log_b M$	$\log_8 3^5 = 5 \log_b 3$ $\log_b 5 = 2 \log_b 5$

 $= \log_2 x + \log_2 x$



Rules of Logarithms Examples:

Expand using the Rules of Logarithms.



 $\frac{\log_{3} \frac{ab^{2}}{c^{3}}}{\log_{3} ab^{2} - \log_{3} c^{3}}$ $\log_{3} ab^{2} - \log_{3} c^{3}$ $\log_{3} ab^{2} - \log_{3} c^{3}$

Using the Rules of Logarithms, write each expression as a single logarithm (condense), then simplify if possible.

$$\log_{6} 3 + \log_{6} 12$$

$$3\log_5 x - \frac{1}{3}\log_5 y$$

$$2\log_4 x + (\log_4 3y - 4\log_4 z)$$

$$103 + (\log_4 3y - \log_4 z)$$