Questions from Homework

④ a) $\log_2 5 + \log_2 6.4 + \log_2 4$

$= \log_2 (5 \times 6.4 \times 4)$

$= \log_2 128$

$= 7$

$2^y = 128$

$2^y = 2^7$

$y = 7$

8c) $\log_3 (x+y) + \log_3 (x-y) - (\log_3 x + \log_3 y)$

$= \log_3 (x+y) + \log_3 (x-y) - \log_3 xy$

$= \log_3 (x^2 - y^2) - \log_3 xy$

$= \log_3 \left(\frac{x^2 - y^2}{xy} \right)$

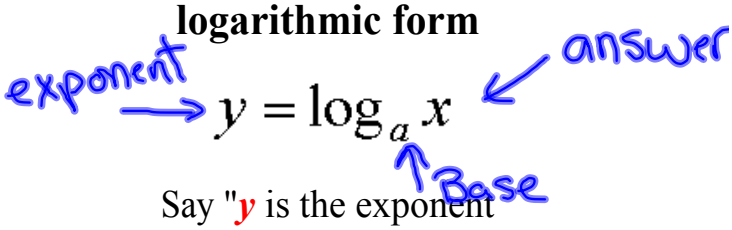
Logarithms

exponential form

$$x = a^y$$

Say "the base ***a*** to the exponent ***y*** is ***x***."

logarithmic form



Say "***y*** is the exponent to which you raise base ***a*** to get the answer ***x***."

$$x = a^y \longleftrightarrow y = \log_a x$$

Law of Logarithms for Powers

$$\log_a(N^p) = p\log_a N \qquad N \in R, a > 0, a \neq 1$$

Since *p* can be expressed as a whole number or a fraction, this law can be expressed as follows.

Law of Logarithms for Roots

$$\log_a(N^{\frac{p}{q}}) = \frac{p}{q}\log_a N \qquad N \in R, a > 0, a \neq 1$$

Example 1

a) $\log_{10} \sqrt[4]{1000}$

$= \log_{10}(1000^{\frac{1}{4}})$

$= \frac{1}{4}(\log_{10} 1000)$

$= \frac{1}{4}(3)$

$= \frac{3}{4}$

b) $\log_2 32^{\frac{1}{3}}$

$= \frac{1}{3}(\log_2 32)$

$= \frac{1}{3}(5)$

$= \frac{5}{3}$

Example 2 Combining Laws

Express each of the following as a single logarithm.

a) $3\log_3 2 + \log_3 4$

$\log_3 2^3 + \log_3 4$

$\log_3 8 + \log_3 4$

$\log_3 32$

b) $2\log_2 9 + \log_2 6 - 3\log_2 3$

$\log_2 9^2 + \log_2 6 - \log_2 3^3$

$\log_2 81 + \log_2 6 - \log_2 27$

$\log_2 \left(\frac{81 \cdot 6}{27}\right)$

$\log_2 18$

Homework