Questions from Homework

③ f) $\log_2(64\sqrt[3]{2})$

$\log_2((2^6)(2^{1/3}))$

$\log_2(2^{19/3})$

$\frac{19}{3}(\log_2 2)$ → $2^1 = 2$

$y = 1$

$\frac{19}{3}(1)$

$\frac{19}{3}$

⑥ $\log_a x = m$ $\log_a y = n$

a) $\log_a\left(\frac{x}{y}\right)$

$\log_a x - \log_a y$

$m - n$

b) $\log_a(xy)^2$

$2(\log_a xy)$

$2(\log_a x + \log_a y)$

$2(m + n)$

⑦ a) $\log_2[(8)(\sqrt{32})] + \log_7[(49)(\sqrt[4]{7})]$

$\log_2[(2^3)(2^{5/2})] + \log_7[(7^2)(7^{1/4})]$

$\log_2(2^{11/2}) + \log_7(7^{9/4})$

$\frac{11}{2} + \frac{9}{4}$

$\frac{22}{4} + \frac{9}{4}$ → $31/4$

Logarithms

exponential form

$$x = a^y$$

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

logarithmic form

$$y = \log_a x$$

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

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

Logarithm of a Product

$$\log_a M + \log_a N = \log_a (M \times N)$$

Logarithm of a Quotient

$$\log_a M - \log_a N = \log_a \left(\frac{M}{N} \right)$$

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

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

When you work with equations involving logarithms you need to use the laws of logarithms, which are summarized below:

$$\log_a M + \log_a N = \log_a (M \times N)$$ Product

$$\log_a M - \log_a N = \log_a \left(\frac{M}{N} \right)$$ Quotient

$$\log_a (N^p) = p \log_a N$$ Power

$$\log_a (N^{\frac{p}{q}}) = \frac{p}{q} \log_a N$$ Root

Example 1

Solve the following and remember to verify your solution

$$\log_3 x - \log_3 4 = \log_3 12$$

$$\log_3 x = \log_3 12 + \log_3 4$$

$$\log_3 x = \log_3 48$$

$$x = 48$$

Example 2

If $\log_a x = m$ and $\log_a y = n$ then express the following in terms of *m* and *n.*

$$\log_a\left(\frac{ax}{y}\right)^2$$

$$2\left(\log_a\left(\frac{ax}{y}\right)\right)$$

$$2\left(\log_a ax - \log_a y\right)$$

$$2\left(\log_a a + \log_a x - \log_a y\right)$$

$$2(1 + m - n)$$

$$2 + 2m - 2n$$

Homework

① a) $\log_a 64 = 6$

↳ $a^6 = 64$

2a) $a^3 = 8$

↳ $\log_a 8 = 3$

↳ $3 = \log_a 8$