Day 83

8.4 Notes: Properties of Logarithms

(1) $\log_y MN = \log_y M + \log_y N$

$\longrightarrow$ expand

condense $\longleftarrow$

(ex) Expand $\log_2 7p = \log_2 7 + \log_2 p$

(2) $\log_y \frac{M}{N} = \log_y M - \log_y N$

(ex) Expand $\log\left(\frac{y}{3}\right) = \log y - \log 3$

(3) $\log_y M^x = x \log_y M$

$\log_3 x^2 = 2 \log_3 x$

condensed $\longleftrightarrow$ expanded

Examples:

write as a single logarithm. (condense)

(1) $\log 7 + \log 2 = \log 14$

(2) $5 \log 3 + \log 4 =$ do exponents 1st!

$\downarrow$

$\log 3^5 + \log 4 = \log 243 + \log 4$

$\log 972$

(ex) $4\log m - \log n$

$\log m^4 - \log n = \log \frac{m^4}{n}$

Expand. (do exponents last)

(ex) $\log x^3 \cdot y^5 = \log x^3 + \log y^5$

$= 3\log x + 5\log y$

$3\log x + 5\log y$

(ex) $\log_4 5\sqrt{x} = \log_4 5x^{\frac{1}{2}}$

$= \log_4 5 + \log_4 x^{\frac{1}{2}}$

$\log_4 5 + \frac{1}{2}\log_4 x$

(ex) $\log\sqrt{\frac{2x}{y}} = \log\left(\frac{2x}{y}\right)^{1/2}$

$= \frac{1}{2}\log\left(\frac{2x}{y}\right)$

$\frac{1}{2}(\log 2 + \log x - \log y)$

Evaluate.

$\log_2 4 - \log_2 16 = \log_2\left(\frac{4}{16}\right)$

$\log_2\left(\frac{1}{4}\right) = x$

$2^x = \frac{1}{4} < \frac{2}{2}$

$2^x = \frac{1}{2^2}$

$2^x = 2^{-2}$

$x = -2$

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p. 457-459

(2-30 Even, 34-40 even, 58-68 E, 91-93)

(ex) $\log_3 3^1 + 5\log_3 3$

$1 + 5(1) = 6$

(ex) $2\log_3 3 - \log_3 3$

$2(1) - 1$

$2 - 1$

1

(ex) $\log_6 4 + \log_6 9 = 2$

$\log_6 36 = x$

$6^x = 36 < \frac{6}{6}$

$6^x = 6^2$