7.4 Properties of Logarithms

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	$\log_b m^p = p \log_b m$

example

$\log_2(4 \cdot 3) = \log_2 4 + \log_2 3$

1. $\log_7(3x) =$ $\log_7 3 + \log_7 x$

2. $\log_5 \frac{w}{y} =$ $= \log_5 w - \log_5 y$

3. $\log_3 x^5 =$ $5 \log_3 x$

Write as a sum/difference of logs

4. $\log_2 \frac{a^7}{c} =$ $\log_2 a^7 - \log_2 c$

$= 7\log_2 a - \log_2 c$

5. $\log_w xy^3 =$ $\log_w x + \log_w y^3$

$= \log_w x + 3\log_w y$

6. $\log_5 \frac{a^7}{xy^4} =$ $\log_5 a^7 - \log_5 xy^4$

Careful!

$= 7\log_5 a - (\log_5 x + \log_5 y^4)$

$= 7\log_5 a - (\log_5 x + 4\log_5 y)$

$= 7\log_5 a - \log_5 x - 4\log_5 y$

Write as a single logarithm.

6. $2\log_5 w - 4\log_5 c$

$= \log_5 w^2 - \log_5 c^4$

$= \log_5\left(\frac{w^2}{c^4}\right)$

7. $\log_x c + 3\log_x w$

$= \log_x c + \log_x w^3$

$= \log_x c w^3$

More practice....

Write as a single logarithm.

1. $4\log_3 w - \log_3 x + \log_3 k$

$= \log_3 w^4 - \log_3 x + \log_3 k$

$= \log_3 \frac{w^4}{x} + \log_3 k$

$= \log_3 \frac{w^4 k}{x}$

2. $4\log_3 w - \log_3 x - \log_3 k$

$= \log_3 w^4 - \log_3 x - \log_3 k$

$= \log_3 \frac{w^4}{x} - \log_3 k$

$= \log_3 \frac{w^4}{xk}$

3. $\log_5 w + 2$

need to replace with $\log_5 \frac{x}{1}$

$2 = \log_5 x$ ← figure out this!

$5^2 = x$

$25 = x$

Make this "speak log"

$= \log_5 w + \log_5 25$

$= \log_5 (25w)$

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

$3 = \log_2 z$ ← what is this?

$2^3 = z$

$8 = z$

Make this "speak log"

$= \log_2 8 - \log_2 x - 2\log_2 y$

$= \log_2 \frac{8}{x} - \log_2 y^2$

$= \log_2 \left(\frac{8}{xy^2}\right)$