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MATH 2311
Pre-Calculus I
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3.4: Properties of logarithms.

Sum to product property:

$$\log_b(x) + \log_b(y) = \log_b(xy).$$

Rewrite as a single logarithm:

$$\log_7(2) + \log_7(x^2) = \log_7(2x^2).$$

$$\log_2(x) + \log_2(x-1) + \log_2 3.$$

$$= \log_2(3x(x-1))$$

Difference to Quotient Property:

$$\log_b(x) - \log_b(y) = \log_b(x/y).$$

$$\log_4(12) - \log_4(3) = \log_4(12/3) = \log_4(4). = 1$$

$$\log_2(x) - \log_2(y) - \log_2(z)$$

$$\Rightarrow \log_2(x) - (\log_2(y) + \log_2(z))$$

a) $\log_2(x) - \log_2(yz)$.

$= \log_2\left(\frac{x}{yz}\right)$.

$\log_2(x) - \log_2(y) + \log_2(z)$

$= \log_2(xz) - \log_2(y)$

$= \log_2\left(\frac{xz}{y}\right)$.

Power to coefficient:

$\log_b(x^n) = n\log_b(x)$.

$\log_7(x^4) = 4\log_7(x)$.

Why? $\log_3(x^2) = \log_3(x \cdot x) = \log_3(x) \cdot \log_3(x)$.

$= 2\log_3 x$.

$\log_4(y) + \log_4(x^{-2})$

$\log_4(y) - 2\log_4(x) = \log_4 y/x^2$.

$$\log_3(\sqrt{x}) = \log_3 x^{1/2} = \frac{1}{2}\log_3 x.$$

Rewrite the following as a single logarithm.

$$\frac{1}{2}\log_3(x-y) + \log_3(4) - 5\log_3(x) - \log_3(2).$$

$$= \log_3(\sqrt{x-y}) + \log_3(4) - \log_3 x^5 - \log_3 2.$$

$$= \log_3\left(\frac{4\sqrt{x-y}}{2x^5}\right).$$