Sec 8-4: Properties of Logarithms

From Page 454:

Properties **Properties of Logarithms**

For any positive numbers, M, N, and b, $b \neq 1$,

$\log_b MN = \log_b M + \log_b N$	**Product Property**
$\log_b \frac{M}{N} = \log_b M - \log_b N$	**Quotient Property**
$\log_b M^x = x \log_b M$	**Power Property**

Use the Properties of Logarithms to write this as a single logarithm:

$$\text{Log}B + 2\text{Log}C + 4\text{Log}D$$

$$= \text{Log}B + \text{Log}C^2 + \text{Log}D^4$$

$$= \log(BC^2D^4)$$

Write as a single logarithm.

$$3\log_2 A - \frac{1}{3}\log_2 B - 4\log_2 C$$

$$= \log_2 A^3 - \log_2 B^{\frac{1}{3}} - \log_2 C^4$$

$$= \log_2 A^3 - \log_2 \sqrt[3]{B} - \log_2 C^4$$

$$= \log_2 \left(\frac{A^3}{\sqrt[3]{B}\,C^4}\right)$$

Write as a single logarithm.

$$-5\ln W + \frac{2}{3}\ln K - 4\ln Q + 0.6\ln G \qquad .6 = \tfrac{3}{5}$$

$$= -\ln W^5 + \ln K^{2/3} - \ln Q^4 + \ln G^{3/5}$$

$$= -\ln W^5 + \ln \sqrt[3]{K^2} - \ln Q^4 + \ln \sqrt[5]{G^3}$$

$$= \ln \frac{\sqrt[3]{K^2}\,\sqrt[5]{G^3}}{W^5 Q^4}$$

Write as a single logarithm.

$$5\log D - \frac{1}{3}\left(4\log E - \frac{1}{2}\log F\right)$$

$= 5\log D - \frac{4}{3}\log E + \frac{1}{6}\log F$

$= \log D^5 - \log E^{4/3} + \log F^{\frac{1}{6}}$

$= \log \dfrac{D^5 \sqrt[6]{F}}{\sqrt[3]{E^4}}$

Write each as a single logarithm then evaluate.

$$2\log_9 6 - \log_9 12$$

$= \log_9 6^2 - \log_9 12$

$= \log_9 36 - \log_9 12$

$= \log_9 {}^{36}/_{12} = \log_9 3 = \frac{1}{2}$

$9^? = 3 \rightarrow \sqrt{9} = 3 \rightarrow 9^{\frac{1}{2}} = 3$

Write each as a single logarithm then evaluate.

$$\frac{1}{2}\text{Log}_6 81 + 2\text{Log}_6 2$$

$\text{Log}_6 81^{1/2} + \text{Log}_6 2^2$

$= \log_6 9 + \log_6 4 = \log_6 36 = 2$

$6^? = 36$