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 each as a single logarithm:

1. $3\log_4 K + 2\log_4 Q$

$\log_4 K^3 + \log_4 Q^2$

$= \boxed{\log_4 K^3 Q^2}$

2. $5\log R - 6\log X + \frac{1}{2}\log Y$

$\log R^5 - \log X^6 + \log Y^{1/2}$

$= \log \frac{R^5 \; Y^{1/2}}{X^6} = \log \frac{R^5 \sqrt{Y}}{X^6}$

Write as a single logarithm.

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

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

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

$= \log \frac{D^5 \; F^{1/6}}{E^{4/3}} = \boxed{\log \frac{D^5 \sqrt[6]{F}}{\sqrt[3]{E^4}}}$

Write as a single logarithm. Give answer with whole number exponents only.

$$6\ln C + 4\ln D^{-2} - \left(\tfrac{1}{2}\ln F + \ln G\right)$$

$$-\tfrac{1}{2}\ln F - \ln G$$

$$\ln C^{6} + \ln D^{-8} - \ln F^{1/2} - \ln G$$

$$= \ln \frac{C^{6} D^{-8}}{F^{1/2}\, G} = \boxed{\ln \frac{C^{6}}{D^{8}\sqrt{F}\; G}}$$

Write as a single logarithm. Give answer with whole number exponents only.

$$-8\log_3 P^{\frac{3}{4}} - 2\log_3 \frac{1}{Q^{5}} + \frac{1}{4}\log_3 R^{6}$$

$$= -\log_3 (P^{3/4})^{8} - \log_3 (Q^{-5})^{2} + \log_3 (R^{6})^{1/4}$$

$$= -\log_3 P^{6} - \log_3 Q^{-10} + \log_3 K^{3/2}$$

$$= \log_3 \frac{K^{3/2}}{P^{6} Q^{-10}} = \log_3 \frac{Q^{10}\sqrt{K^{3}}}{P^{6}}$$

Use the properties of logarithms to evaluate each expression.

$$\log_2 14 + \log_2 12 - \log_2 21$$

$$\log_2 \frac{14\cdot 12}{21} = \underbrace{\log_2 8}_{2^{?}=8} = 3$$

Use the properties of logarithms to evaluate each expression.

$$\frac{1}{2}\log_6 81 + 2\log_6 2$$

$$= \log_6 81^{1/2} + \log_6 2^{2}$$

$$= \log_6 \left[(\sqrt{81})\cdot(4)\right]$$

$$= \underbrace{\log_6 36}_{6^{?}=36} = 2$$

Write each as a single logarithm then evaluate.

$$\boxed{\tfrac{1}{2}}\log_2 36 - 2\log_2 4 - \log_2 3$$

$$= \log_2 36^{1/2} - \log_2 4^2 - \log_2 3$$

$$= \log_2 \frac{\sqrt{36}}{16 \cdot 3} = \log_2 \frac{6}{48} = \underbrace{\log_2 \frac{1}{8}}_{2^? = 1/8 = 1/2^3} = -3$$

You can now finish Hwk #18.

Sec 8-4

Due Tomorrow.

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Problems 14-18, 34, 35, 37, 38

Solve this equation without using a graph, a table, or the Change of Base Formula. Round to the nearest hundredth.

$$5^x = 60$$

Hints:

- What you do to one side of an equation you must do to the other side.
- One of the Properties of Logarithms will help

Take the log of both sides:

$$\log 5^x = \log 60$$

apply the power property of logs.

$$x \log 5 = \log 60$$

DIVIDE Both sides by log 5

$$x = \frac{\log 60}{\log 5} = 2.54$$

Solve. $2\log_4(x+1)=3$

$$\frac{2\log_4(x+1)}{2} = \frac{3}{2}$$

$$\log_4(x+1) = 3/2$$

$$4^{3/2} = x+1$$

$$8 = x+1$$

$$-1 \qquad -1$$

$$x = 7$$