

Notes Section 3.3 - properties of logarithms

product property: $\log_b xy = \log_b x + \log_b y$

quotient property: $\log_b \frac{x}{y} = \log_b x - \log_b y$

power property: $\log_b x^p = p \log_b x$

• express each logarithm in terms of $\log 2$ and $\log 3$.

1. $\log 96 = \log(3 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2)$
 $= \log 3 \cdot 2^5$
 $= \log 3 + 5 \log 2$

2. $\log \frac{32}{9} = \log 32 - \log 9$
 $= \log 2^5 - \log 3^2$
 $= 5 \log 2 - 2 \log 3$

• evaluate each logarithm

1. $\log_2 \sqrt[3]{32} = \log_2 (32)^{1/3}$
 $= \log_2 (2^5)^{1/3}$
 $= \log_2 2^{5/3}$
 $= \frac{5}{3} \log_2 2 = \frac{5}{3}$

2. $3 \ln e^4 - 2 \ln e^2 = 12 \ln e - 4 \ln e$
 $12 - 4$
 8

expand.

$$1. \ln 4m^3n^5 = \ln 4 + \ln m^3 + \ln n^5 \\ = \ln 4 + 3\ln m + 5\ln n$$

$$2. \log \frac{2x-3}{3\sqrt[4]{x}} = \log \frac{2x-3}{3x^{1/4}} \\ = \log(2x-3) - (\log 3 + \frac{1}{4}\log x) \\ = \log(2x-3) - \log 3 - \frac{1}{4}\log x$$

condense.

$$1. \frac{1}{2}\log_4 x - 3\log_4(x-2) = \\ \log_4 x^{1/2} - \log_4(x-2)^3 = \log_4 \frac{\sqrt{x}}{(x-2)^3}$$

$$2. 5\ln(x+1) + 6\ln x = \ln(x+1)^5 + \ln x^6 \\ = \ln(x+1)^5 x^6$$

change of base formula

$$\log_b x = \frac{\log x}{\log b}$$

$$1. \log_6 4 = \frac{\log 4}{\log 6} = \boxed{0.77}$$

$$2. \log_{1/3} 8 = \frac{\log 8}{\log 1/3} = \boxed{-1.89}$$