3.3 PROPERTIES OF LOGARITHMS NOTES

Change of Base Formula

$$\log_a b = \frac{\log b}{\log a}$$

Ex: Use the change of base formula to evaluate

$\log_7 4 = \frac{\log 4}{\log 7} = .712$

Ex: Use your calculator to calculate

$\log_5 100$

$= 2.861$

Laws of Logarithms

Product Rule $\log(xy) = \log x + \log y$

Quotient Rule $\log \frac{x}{y} = \log x - \log y$

Power Rule $\log(x^n) = n \log x$

Ex: Use the Properties of Logs to expand the following expression:

A) $\log_4 xy^6 z^4$

$\log_4 x + 6\log_4 y + 4\log_4 z$

B) $\ln \frac{x}{\sqrt{x^2+1}}$

$\ln x - \frac{1}{2}\ln(x^2+1)$

Ex: Use the Properties of Logs to condense the following expressions:

A) $\ln x + 3\ln(x+1)$

$\ln x(x+1)^3$

b) $4[\ln z + \ln(z+5)] - 2\ln(z-5)$

$\ln \frac{z^4(z+5)^4}{(z-5)^2}$

Ex: Given the following log values, calculate each of the following:

$\log_b A = 1.25$

$\log_b C = -2.31$

$\log_b K = 4.77$

A) $\log_b \frac{K^2}{C}$

$2\log_b K - \log_b C$

$2(4.77) - (-2.31)$

11.85

B) $\log_b \sqrt{AC}$

$\frac{1}{2}\log_b(AC)$

$\frac{1}{2}(\log_b A + \log_b C)$

$\frac{1}{2}(1.25 + (-2.31)) = -.53$