

Properties of Logarithms

(covers Sullivan 5.5)

Properties of Logarithms

$$\log_a(AB) = \log_a A + \log_a B$$

$$\log_a \left(\frac{A}{B} \right) = \log_a A - \log_a B$$

$$\log_a A^C = C \log_a A$$

(Note: A and B must be positive)

Ex 1.

Expand each expression using the properties of logarithms.

$$\log 100x^2\sqrt{y+1}$$

$$\log_5 \frac{\sqrt[3]{x}}{25y^3}$$

$$\ln \left(\frac{3x^2+15x+18}{e^5 \cdot \sqrt[3]{x} \cdot (2x+1)^3} \right)$$

Ex 2.

Write each expression as a single logarithm.

$$\log(4x - 3) - \log x$$

$$\frac{1}{4} \log_b x - 2 \log_b 5 - 10 \log_b y$$

Ex 3.

Evaluate without a calculator: $\log_2 10 + \log_2 6 - \log_2 5 - \log_2 3$

Change of Base Theorem

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

Ex 4.

Use the Change of Base Theorem to rewrite $\log_5 17$ in terms of natural logarithms. Then use a calculator to evaluate to four decimal places.