

9.3 Properties of logarithms

1. $\log_a(uv) = \log_a u + \log_a v$ / $\ln(uv) = \ln u + \ln v$

2. $\log_a \frac{u}{v} = \log_a u - \log_a v$ / $\ln \frac{u}{v} = \ln u - \ln v$

3. $\log_a u^n = n \log_a u$ / $\ln u^n = n \ln u$

Ex: Use $\ln 2 = .693$ and
 $\ln 3 = 1.099$. Find

$$\begin{aligned} 1. \quad \ln \frac{2}{3} &= \ln 2 - \ln 3 \\ &= .693 - 1.099 \\ &= \textcircled{-.406} \end{aligned}$$

2. $\ln 6$

$$\begin{aligned} \ln (2 \cdot 3) &= \ln 2 + \ln 3 \\ &= .693 + 1.099 \\ &= 1.792 \end{aligned}$$

Rewrite using properties of logs:

$$\log_{10} 7x^3$$

$$\log_{10} 7 + \log_{10} x^3$$

$$\log_{10} 7 + 3 \log_{10} x$$

Ex: $\ln \sqrt[3]{x^2-9}$

$$\ln (x^2-9)^{\frac{1}{3}}$$

$$\frac{1}{3} \ln (x^2-9)$$

$$\frac{1}{3} \ln (x-3)(x+3)$$

$$\frac{1}{3} (\ln (x-3) + \ln (x+3))$$

Use the properties of logs to condense:

$$\underline{2} \log_4 x + \log_4 3$$

$$\log_4 x^2 + \log_4 3$$

$$\boxed{\log_4 3x^2}$$

$$\text{Ex: } 3(\ln 4 + \ln x)$$

$$3 \ln 4x$$

$$\ln (4x)^3 \leftrightarrow \ln 64x^3$$

p. 612

4-104 multipliers
of 4, all evens
extra credit