

Lecture 6

Tuesday, April 11, 2023

9:54 PM

* Questions....

Goal: Combine many logarithms into a single logarithm

Properties of logarithms:

$$1) \log_a x + \log_a y = \log_a(xy)$$

$$2) \log_a x - \log_a y = \log_a\left(\frac{x}{y}\right)$$

$$3) \log_a \frac{1}{x} = -\log_a x$$

$$4) \log_a x^r = r \log_a x$$

$$5) \log_{a^r} x = \frac{1}{r} \log_a x$$

$$\text{Ex} \\ = -\frac{1}{2} \log_3 x = \log_3 x^{-\frac{1}{2}}$$

$$\text{or } -\frac{1}{2} \log_3 x = -\log_{3^2} x = -\log_9 x = \log_9\left(\frac{1}{x}\right)$$

$$\text{Ex} \\ = -\frac{1}{2} \log_3 x + 2 \log_3 y = \log_3 x^{-\frac{1}{2}} + \log_3 y^2 = \log_3 (x^{-\frac{1}{2}} y^2) \\ = \log_3 \left(\frac{y^2}{\sqrt{x}}\right)$$

$$\stackrel{Ex}{=} 2 \log_4 x - \frac{1}{3} \log_8 x$$

$$= 2 \log_{2^2} x - \frac{1}{3} \log_{2^3} x = 2 \cdot \frac{1}{2} \log_2 x - \frac{1}{3} \cdot \frac{1}{3} \log_2 x$$

$$= \log_2 x - \frac{1}{9} \log_2 x$$

$$= \frac{8}{9} \log_2 x = \log_2 (x^{8/9})$$

$$\stackrel{Ex}{=} 2 \log \sqrt{x} - \frac{1}{2} = \log \sqrt{x^2} - \frac{1}{2} = \log x - \frac{1}{2}$$

$$= \log x - \log 10^{1/2}$$

$$= \log \frac{x}{10^{1/2}} = \log \left(\frac{x}{\sqrt{10}} \right).$$