

The background of the slide is a close-up, top-down view of a stack of cut logs. The logs are of various diameters and are stacked in a somewhat irregular pattern, creating a dense, textured surface. The wood is a warm, golden-brown color, and the grain is visible on many of the circular ends. The lighting is soft, highlighting the natural textures and colors of the wood.

Section 8.5

Properties of Logarithms

Properties of Logarithms

bases must be equal!

Product Property	$\log_b m + \log_b n = \log_b (m \cdot n)$	+ → *
Quotient Property	$\log_b m - \log_b n = \log_b \frac{m}{n}$	- → ÷
Power Property	$\log_b m^n = n \cdot \log_b m$	

→ write as a single logarithm

① Coefficients → exponents

Condense the Expressions

• $\log 6 + 2 \log 2 - \log 3$

$$\log 6 + \log 2^2 - \log 3$$

$$\log(6 \cdot 2^2) - \log 3$$

$$\log 24 - \log 3 = \log \frac{24}{3} = \log 8$$

• $\frac{1}{5} [\log_3 x + \log_3(x-2)] - \log_3 x$

$$\frac{1}{5} [\log_3(x^2 - 2x)] - \log_3 x$$

$$\log_3(x^2 - 2x)^{1/5} - \log_3 x =$$

$$\log_3 \left[\frac{(x^2 - 2x)^{1/5}}{x} \right]$$

• $\frac{1}{3} \ln x + 5 \ln(x-3)$

$$= \ln x^{1/3} + \ln(x-3)^5$$

$$= \ln [x^{1/3} (x-3)^5]$$

$$= \ln [\sqrt[3]{x} \cdot (x-3)^5]$$

Both Good!

Expand the Expressions

• $\log_4 5x^3y$

$\log_4 5 + \log_4 x^3 + \log_4 y$

$\log_4 5 + 3 \log_4 x + \log_4 y$

• $\log \frac{x^2-1}{x^3} = \log \frac{(x+1)(x-1)}{x^3}$

$= \log(x+1) + \log(x-1) - \log x^3$

$= \log(x+1) + \log(x-1) - 3 \log x$

• $\ln \frac{\sqrt{3x-5}}{7} = \ln \frac{(3x-5)^{1/2}}{7}$

$\frac{1}{2} \ln(3x-5) - \ln 7$

• $\log_2 \frac{\sqrt{x}y^4}{z^4} =$

$\frac{1}{2} \log_2 x + 4 \log_2 y - 4 \log_2 z$

Change of Base Formula

Rewriting with common logarithms: $\log_b a = \frac{\log a}{\log b}$ base 10

Rewriting with natural logarithms: $\log_b a = \frac{\ln a}{\ln b}$ base "e"

Evaluate the expressions using common and natural logarithms

a.) $\log_3 7 = \frac{\log 7}{\log 3}$
or
 $\frac{\ln 7}{\ln 3}$

b.) $\log_4 29 = \frac{\log 29}{\log 4}$
 $\frac{\ln 29}{\ln 4}$

Practice Problems

Textbook page 496 – 497

- #30 – 45 (expand) *38 - 44 evens*
- #46 – 57 (condense) *51, 53, 57*
- #58 – 73 (change of base formula) *58 - 64 evens*
- #77 – 79 (apps) ***