

Algebra 2

Unit 1 Lesson 9: Properties of Logarithms

- Define the following log properties:
 - > Product Property
 - > Quotient Property
 - > Power Property
- Expand & Condense logs using Log properties

Product Property:

$$\log_b (uv) = \log_b u + \log_b v$$

mult
add

Expand the expressions.

$$X^4 \cdot X^6 = X^{10}$$

$$\log_2 9x$$

$$\log_2 9 + \log_2 x$$

$$\log_3 x = 4$$

$$\log_4 16xy$$

$$3^y = x$$

$$\log_4 16 + \log_4 x + \log_4 y$$

$$2 + \log_4 x + \log_4 y$$

Quotient Property:

$$\log_b \frac{u}{v} = \log_b u - \log_b v$$

$$\frac{x^{16}}{x^6} = x^{10}$$

Expand the expressions.

$$\log \frac{x}{36} = \log x - \log_{10} 36$$

$$\ln \frac{139}{z} = \ln 139 - \ln z$$

$$\begin{array}{l} \log_{10} \\ \ln \\ \log_e \end{array}$$

Power Property:

$$\log_b u^n = n \log_b u$$

Expand the expression.

$$\log_5 x^3 - \ln y^5$$

$$3 \log_5 x - 5 \ln y$$

$$\log(3x)^3$$

$$3 \log 3x$$

$$3 (\log 3 + \log x)$$

$$3 \log 3 + 3 \log x$$

Recap:

Product Property:

$$\log_b uv = \log_b u + \log_b v$$

Quotient Property:

$$\log_b \frac{u}{v} = \log_b u - \log_b v$$

Power Property:

$$\log_b u^n = n \log_b u$$

U1 L9 - Properties of Logarithms

Combining Properties:

Expand the expressions.

$$\left(\begin{matrix} x^2 & y^1 \end{matrix} \right)^3$$

$$x^6 \quad y^3$$

$$\log(10^1 x^2 y^2)$$

$$\log(10^2 x^4 y^2)$$

$$2 \log(10 x^2 y)$$

$$2(\log_{10} 10 + 2 \log x + \log y)$$

$$\log_{10} 100 + \log x^4 + \log y^2$$

$$2 + 4 \log x + 2 \log y$$

$$2(1 + 2 \log x + \log y)$$

$$\log_2 \frac{34x^2 y}{z} = \log_2 34x^2 y - \log_2 z$$

$$\log_2 34 + 2 \log_2 x + \log_2 y - \log_2 z$$

$$\log_8 \frac{x^3 y^2}{z^4}$$

$$\log_8 x^3 y^2 - \log_8 z^4$$

$$\log_8 x^3 + \log_8 y^2 - \log_8 z^4$$

$$3 \log_8 x + 2 \log_8 y - 4 \log_8 z$$

Condense the following expressions:

$$3\log x + 2\log y + 1\log z$$

Exp: Q Pr Po
Con: Po Pr Q

$$\log x^3 + \log y^2 + \log z^1$$

$$\log x^3 y^2 z^1$$

$$2(\ln 3x - \ln 6y^2)$$

$$2 \ln \left(\frac{3x}{6y^2} \right)$$

$$\ln \left(\frac{3x}{6y^2} \right)^2$$

$$\log_2 4a + 3\log_2 a - 4\log_2 (2b)$$

$$\log_2 4a + \log_2 a^3 - \log_2 (2b)^4$$

$$\log_2 (4a \cdot a^3)$$

$$\log_2 4a^4 - \log_2 (2b)^4$$

$$\log_2 \left(\frac{4a^4}{(2b)^4} \right)$$