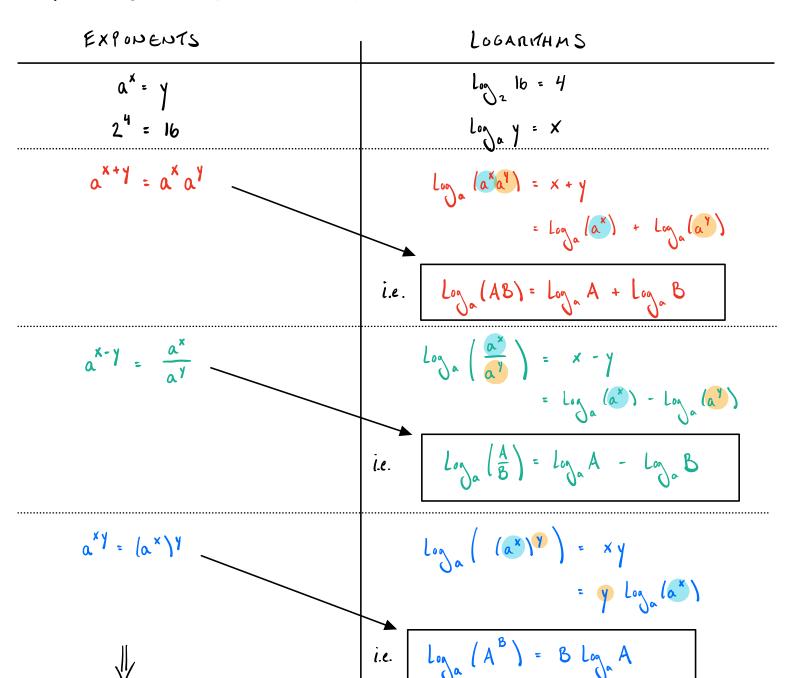
ANYTHING SAID USING EXPONENTS CAN ALSO BE SAID USING LOGARITHMS



LAWS OF LOGARITHMS

Let a be a positive number, with $a \neq 1$. Let A, B, and C be any real numbers with A > 0 and B > 0.

Law

Description

$$1. \log_a(AB) = \log_a A + \log_a B$$

The logarithm of a product of numbers is the sum of the logarithms of the numbers.

$$2. \log_a \left(\frac{A}{B}\right) = \log_a A - \log_a B$$

The logarithm of a quotient of numbers is the difference of the logarithms of the numbers.

$$3. \log_a(A^C) = C \log_a A$$

The logarithm of a power of a number is the exponent times the logarithm of the number.

EXAMPLE 1 Using the Laws of Logarithms to Evaluate Expressions

Evaluate each expression.

- (a) $\log_4 2 + \log_4 32$
- **(b)** $\log_2 80 \log_2 5$
- (c) $-\frac{1}{3} \log 8$

EXAMPLE 2 Expanding Logarithmic Expressions

Use the Laws of Logarithms to expand each expression.

- (a) $\log_2(6x)$
- **(b)** $\log_5(x^3y^6)$ **(c)** $\ln\left(\frac{ab}{\sqrt[3]{c}}\right)$

EXAMPLE 3 Combining Logarithmic Expressions

Use the Laws of Logarithms to combine each expression into a single logarithm.

- (a) $3 \log x + \frac{1}{2} \log(x+1)$
- **(b)** $3 \ln s + \frac{1}{2} \ln t 4 \ln(t^2 + 1)$

Note: Look = Lookox

(IN OUR TEXTBOOK)

WARUNG!

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

$$\frac{\log 6}{\log 2} \neq \log\left(\frac{6}{2}\right) \quad \text{and} \quad (\log_2 x)^3 = 3\log_2 x$$