

Background

Previously, you have seen exponential functions:

$$a^b = c$$

If you wanted to solve for a , you would use a root:

$$\sqrt[b]{c} = a$$

But what if you wanted to solve for b ? This is where logarithms come in:

$$\log_a(c) = b$$

Logarithms have properties:

Property 1: Multiplication becomes addition:

$$\log_a(b \cdot c) = \log_a(b) + \log_a(c)$$

Property 2: Move powers outside:

$$\log_a(b^c) = c \cdot \log_a(b)$$

We saw how to derive these properties in class (from the properties of exponents).

Your Task

Simplify the following expressions involving logarithms, using the given information. Your answer should each be a single real number. Show your work using the properties of logarithms - do NOT just plug these into a calculator! Indicate which property you used for each (for your convenience, you may want to label them “Property 1” and “Property 2” - these aren’t official numbers, just for ease of writing this homework).

1. $\log_2(65536)$, given that $\log_2(256) = 8$ and $65536 = 256^2$
2. $\log_3(81^{42})$, given that $\log_3(81) = 4$.
3. $\log_a(169 \cdot 371293)$, given that $\log_a(169) = 4$ and $\log_a(371293) = 10$. (BONUS: compute a)
4. $\ln(e^x \cdot e^y)$, given that $x = 7$ and $y = 9$