Properties of Logarithms

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Question: How does one make the Cobb-Douglass production function

$$Q = AK^n L^m$$

linear?

Answer: Use properties of logarithms.

Question: How does one make the Cobb-Douglass production function

$$Q = AK^nL^m$$

linear?

Answer: Use properties of logarithms.

Product Rule

For exponential expressions:

$$a^n a^m = a^{n+m}.$$

This translates to the **product rule** for logarithms:

$$\log_a(MN) = \log_a M + \log_a N.$$

Quotient Rule

For exponential expressions:

$$\frac{a^n}{a^m} = a^{n-m}.$$

This translates to the **quotient rule** for logarithms:

$$\log_a \left(\frac{M}{N}\right) = \log_a M - \log_a N.$$

Power Rule

For exponential expressions:

$$(a^n)^m = a^{nm}.$$

This translates to the **product rule** for logarithms:

$$\log_a(M^p) = p \log_a M.$$

Example 1

Use properties of logarithms to write as a sum or difference of constant multiples of logarithms:

$$\ln(xy^2).$$

Example 2

Use properties of logarithms to write as a sum or difference of constant multiples of logarithms:

$$\log_7 \left(\sqrt[3]{\frac{xz}{y}} \right).$$

Back to My Senior Thesis

Write the following as something "linear":

$$Q = AK^n L^m.$$

Example 3

Write the expression as the logarithm of a single quantity:

$$\log_2(A) - 3\log_2(B).$$

Example 4

Write the expression as the logarithm of a single quantity:

$$\frac{3}{2}\ln(X) + \frac{2}{3}\ln(Y) - \ln(Z).$$

Assignment

Assignment: Page 421, 1 - 33(odd), 41 - 49, 89. Due Wednesday.

TYPO: # 20 should be $\log_{10}(10z)$.