

Section 3.4: Properties of log Functions.

Product rule $\log a \cdot b = \log a + \log b$

Quotient rule $\log \frac{a}{b} = \log a - \log b$

Power rule $\log a^b = b \log a$

proof ex 1 p 283.

Examples:

Expand: $\ln 2x = \ln 2 + \ln x$ Product Rule

$\ln \frac{2}{x} = \ln 2 - \ln x$ (Q)

$\ln(x \cdot y^4) = \ln x + \ln y^4$ Product Rule
 $= \ln x + 4 \ln y$ Power Rule

$\ln\left(\frac{\sqrt{x}}{\sqrt{y}}\right) = \ln \sqrt{x} - \ln \sqrt{y}$ Quotient
 $= \ln x^{1/2} - \ln y^{1/2}$ Power
 $= \frac{1}{2} \ln x - \frac{1}{2} \ln y$
 $= \frac{1}{2} (\ln x - \ln y)$

$$\sqrt[n]{x^m} = x^{\frac{m}{n}}$$
$$\sqrt[4]{x^3} = x^{3/4}$$

$$\sqrt{x} = x^{1/2}$$

Write as a single log:

$$\begin{aligned}
 \text{Power} \quad 2 \ln x + \frac{1}{2} \ln y &= \ln x^2 + \ln y^{1/2} = \ln x^2 + \ln \sqrt{y} \\
 &= \ln x^2 \cdot \sqrt{y} \\
 \ln x^5 - 2 \ln(xy) &= \ln x^5 - \ln(xy)^2 \\
 \text{Power} \quad &= \ln \frac{x^5}{(xy)^2} = \ln \frac{x^5}{x^2 y^2} \\
 &= \ln \frac{x^3}{y^2}
 \end{aligned}$$

Hw p 289 # 1-22