8-4/8-5 Log Properties

std. 11.0

ex. 1 **Find the inverse of** $y = \ln(x - 10)$

$x = \ln(y-10)$

$x = \log_e(y-10)$

$e^x = y - 10$

$e^x + 10 = y$

$y = \log_e(x-10)$

$e^y = x - 10$

$e^y + 10 = x$

$e^x + 10 = y$

Properties of Logarithms

For $b, m, n > 0$ and $b \neq 1$,

- $\log_b(mn) = \log_b m + \log_b n$ **(product property)**
- $\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$ **(quotient property)**
- $\log_b m^n = n \log_b m$ **(power property)**

ex. 2 **Expand:**

a) $\ln 2x^6$

$= \ln 2 + \ln x^6$

$= \ln 2 + 6 \ln x$

b) $\log_7\left(\frac{\sqrt{y}}{49x}\right)$

$= \log_7 \sqrt{y} - \log_7 49x$

$= \log_7 y^{1/2} - (\log_7 49 + \log_7 x)$

$= \frac{1}{2}\log_7 y - 2 - \log_7 x$

ex. 3 Given $\log_9 5 \approx .732$, $\log_9 11 \approx 1.091$

Find: a) $\log_9 \frac{5}{11} = \log_9 5 - \log_9 11 \approx .732 - 1.091$

b) $\log_9 25 = \log_9 5^2 = 2\log_9 5 \approx 2(.732)$

ex. 4 Condense to a single logarithm:

a) $2\ln 8 - 3\ln 2$

$= \ln 8^2 - \ln 2^3$

$= \ln\left(\frac{64}{8}\right) = \ln 8$

b) $\frac{3}{4}\log x + \log 25$

$= \log x^{3/4} + \log 25$

$= \log\left(25\sqrt[4]{x^3}\right)$