Section 5.4: Properties of Log Functions

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1:46 PM

Calculate

$\log 4.2 = 0.623249$
$\log 42 = 1.623249$
$\log 420 = 2.623249$
$\log(1000 \times 4.2) = \log 4200 = 3.623249 = 3 + 0.623249$

$$\log(1000 \times 4.2) = \log 1000 + \log 4.2$$

product rule:

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

example: express as a single logarithm and simplify

① $\log_3 5x + \log_3 7y$

$\log_3(35xy)$

② $\log_3 8x^4 + \log_3 \frac{x}{24} + \log_3 x^{-5}$

$\log_3\left(8x^4 \cdot \frac{x}{24} \cdot \frac{1}{x^5}\right)$

$24 \quad x^5$

$\log_3 \left(\frac{1}{3}\right)$

$\log_3 3^{-1}$

-1

the power rule:

$$\log x^3 = \log (x \cdot x \cdot x)$$

$$= \log x + \log x + \log x$$

$$= 3 \log x$$

rule:

$$\log_a M^p = p \log_a M$$

example: rewrite using the power rule:

$\ln x^{10} = 10 \ln x$

$\log \left(\frac{1}{y}\right) = -\log y$

$\log_3 2^x = x \log_3 2$

$\log \sqrt{2} = \frac{1}{2} \log 2$

$7 \ln x^2 = 14 \ln x$ or $2 \ln x^7$ or $\ln x^{14}$

note: $7 \ln x^2 = \ln (x^2)^7 = \ln x^{14}$

example: simplify:

$$3 \ln x^2 + 2 \ln x^3$$

$6 \ln x + 6 \ln x$

$12 \ln x$

$\ln x^6 + \ln x^6$

$\ln (x^6 \cdot x^6)$

$\ln x^{12}$