

Semester 1 Review: Chapter 3

Key Concepts:

1. The 5 Log Rules	2. Solving Exponentials
3. Solving Logarithms	4. Exponential Growth/Decay

1. The 5 Log Rules

Product Rule: $\log_a(xy) = \log_a(x) + \log_a(y)$	Quotient Rule: $\log_a\left(\frac{x}{y}\right) = \log_a(x) - \log_a(y)$
Power Rule: $\log_a(x^n) = n * \log_a(x)$	Change of Base: $\log_y(x) = \frac{\log_a(x)}{\log_a(y)}$
Change from Exponential Form \rightarrow Logarithmic Form and Logarithmic Form \rightarrow Exponential Form $\log_a(x) = y \quad \rightarrow \quad a^y = x$	
a. Fully Expand: $\ln\left(\frac{x^2 z^4}{y^3}\right)$	b. Fully Condense: $8\log_2(\alpha) - 3\log_2(\beta^4) + 3\log_4(2\alpha) - 4\log_2(\alpha)$
c. Rewrite using only natural logarithms $\log_{1.2}(3.5)$	d. Change to logarithmic form $4^x = 64$

2. Solving Exponentials

a. $4^{6x} = 64$	b. $4 * 2^{2x+8} = 128$
c. $9 * \left(\frac{1}{3}\right)^{2x} = 1$	d. $2^{3x-1} = \frac{1}{4}$
e. $\frac{2}{3} * 2^{6-x} = \frac{16}{3}$	f.

3. Solving Logarithms

a. $\log\left(\frac{1}{\sqrt[3]{10^2}}\right) = x$

b. $\ln\left(\frac{1}{\sqrt{e^6}}\right) = x$

c. $\log(x) = 10,000$

d. $\ln(x + 1) - 2 \ln(x + 1) = 2 \ln(x - 1)$

e. $\log_3(x^2 - 1) = \log_3(2x) + \log_3(4)$

f. $y = \ln\left(\frac{1}{\sqrt{e^2}}\right)$

g. $\log(x) = \frac{1}{1,000}$

h. $\log_5(x + 3) = \log_5(4x) + \log_5(x)$

i. $-2 \ln(x) + \ln(x^2 + x) = 2 \ln\left(\frac{1}{x}\right)$

j. $y = \log\left(\frac{1}{\sqrt[3]{10}}\right)$

k. $\ln(\sqrt[5]{e}) = z$

l. $\ln(3x - 2) + \ln(x - 1) = 2 \ln(x)$

4. Exponential Growth/Decay: Determine if the following are exponential growth or decay

a. $f(x) = 2 * 3^{2-x}$

b. $g(x) = 5 \left(\frac{1}{3}\right)^{-x}$

c. $h(s) = \frac{1}{3} * 2^{s-8} - 3$

d. $f(\phi) = \frac{5}{2} * \frac{4^4 \phi^{+2}}{5} - 3$