

Section 2.5: Logarithmic Functions

$y = \log_b x$ is the logarithm function of base $b > 0$ and $b \neq 1$

Example: Compute the logarithms.

$$\log_2 8 = \underline{\hspace{2cm}} \quad \log_3 \frac{1}{9} = \underline{\hspace{2cm}} \quad \log_5 625 = \underline{\hspace{2cm}} \quad \log_5 10 = \underline{\hspace{2cm}}$$

Change of base formula:

Example: Find the domain of these functions.

$$y = \log_{21}(x + 5)$$

$$y = \log(2 - 7x)$$

Logarithm Rules

$$\log(AB) = \log(A) + \log(B)$$

$$\log(A^x) = x \log(A)$$

$$\log_b b^x = x$$

$$\log\left(\frac{A}{B}\right) = \log(A) - \log(B)$$

$$\log(1) = 0$$

$$b^{\log_b(x)} = x$$

Example: Simplify the following.

A) $\log \frac{(x+1)^3 y^2}{z^3}$

B) $\ln \left(\frac{x^4}{y^5 z^2} \right)$

C) $\ln(3e^{5x})$

D) $\ln(3 + e^{5x})$

Example: Write the following as a single logarithm.

$$2\log(x + 4) - 7\log(w) + 5\log(y)$$

Example: Use this information to compute the following.

$$\log_b 2 = 0.54 \quad \log_b 3 = 0.86 \quad \log_b 5 = 1.26$$

A) $\log_b 6 =$

B) $\log_b 25b^2 =$

Example: Solve for x

A) $2 * 7^{3x+5} = 6$

B) $\log(x + 2) + \log(x - 2) = 1$

C) $\ln(2x + 7) + \ln(4) = \ln(x + 7)$

D) $\log_x(12 - x) = 2$

Example: If you invest \$8000 at 7.5% compounded monthly, how long until the account will have a balance of \$12,000?