Bell Work

$Solve: 2^{x-4} = 64$

$Solve: 3^{x} = 25$

PRE-CALC TRIG

Day 24

■ Objective:

Evaluate exponential functions with base a (and base e) and use exponential functions to model real-life problems

Evaluate logarithmic functions (with and without calculators/properties)

Exponential and Logarithmic Functions

Exponential Function: a function with a variable as exponent

$$f(x) = a^{x-h} + k$$
where $a > 0, a \neq 1 \ and \ x \ is \ any \ real \ number$

Logarithmic Function with Base a:

$$f(x) = \log_a(x - h) + k$$
where $x > 0, a > 0, a \neq 1$

Natural Logarithmic Function:

Natural Base e: $e \approx 2.718281828 \ldots$

$$f(x) = \log_e x = \ln x \quad when \; x > 0$$

Properties of Logarithms

$$\log_a 1 = 0 \qquad \rightarrow a^0 = 1$$

$$\log_a a = 1 \qquad \rightarrow a^1 = a$$

$$\log_a a^x = x \qquad \rightarrow a^{\log_a x} = x$$

$$\log_a x = \log_a y => x = y$$

More Properties

<u>Change of Base: (not as important with our calculators)</u>

$$\log_a x = \frac{\log_b x}{\log_b a}$$

<u>Product Property</u>   <u>Quotient Property</u>

$$\log_a(uv) = \log_a(u) + \log_a(v) \quad \log_a(u/v) = \log_a(u) - \log_a(v)$$

<u>Power Property</u>   <u>Rewrite:</u>

$$\log_a u^n = n \log_a(u) \qquad\qquad \log_b y = x \ <=> \ b^x = y$$

Examples

<u>Expand:</u>

$\log_5 25x^3$

<u>Condense:</u>

$5 \log_6 x + 2 \log_6 7 - 3 \log_6 w$

<u>Simplify:</u>

$\log_4 4$ 　　　　 $\log_3 81$ 　　　　 $\log_8 1$

$9^{\log_9 4x}$

$\log_7 49^{3x}$

Rewrite: From log to exponential or exponential log

$$\log_2 8 = 3$$

$$5^3 = 125$$

For Next Time...

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