#1 base of log = base of exponent

#2 log = exponent

"A Logarithm is an Exponent."

If $y = b^x$, then $\log_b y = x$ ← exponent

base (of b^x) — exponent (x) — base (of $\log_b$)

Review from Yesterday

Ex. Rewrite each equation in its equivalent exponential form:

1. $\log_6 x = 4$

$6^4 = x$

2. $13 = \log(r)$

(10)

$10^{13} = r$

Ex. Rewrite each equation in its equivalent logarithmic form:

1. $5^x = 625$

$\log_5 625 = x$

alpha window #5

2. $3 = 7^y$

$\log_7 3 = y$

4 Basic Properties of Logarithms

1. $\log_b b = 1$

$b^1 = b$ ✓

2. $\log_b 1 = 0$

$b^0 = 1$ ✓

3. $\log_b b^x = x$

$b^x = b^x$ ✓

4. $b^{\log_b x} = x$

$\log_b x = \log_b x$ ✓

Ex. Evaluate these logarithms WITHOUT a calculator:

1. $\log_7 7 = 1$

2. $\log_5 1 = 0$

3. $\log_4 4^5 = 5$

4. $7^{\log_7 6} = 6$

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Two Famous Logarithms

1. **The Common Logarithm** – has a base of 10 $\log_{10} y = x$ but we write $\log y = x$

2. **The Natural Logarithm** – has a base of e $\log_e y = x$ but we write $\ln y = x$

$e \approx 2.718....$

***[Important Note]: All properties of Logarithms apply to Natural Logarithms. They are not separate things. They just have different bases.**

Change of Base Formula: $\log_a n = \frac{\log_b n}{\log_b a}$ $\frac{\log n}{\log a}$

Ex. Use the change of base formula to evaluate the logarithm on your calculator:

1. $\log_5 12 = 1.54$ $\frac{\log 12}{\log 5} = 1.54$

2. $\log_3 18$ $\frac{\log 18}{\log 3} = 2.63$

3. $\log_5 125$ 3 $\frac{\log 125}{\log 5}$

4. $\log_2 16$ 4 $\frac{\log 16}{\log 2}$

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