Déjà Vu, It's Algebra 2!

Lesson 20

Exponential & Log Equations

An Exponential Equation is an equation containing one or more expressions that have a variable as an exponent.

We will look at two methods for solving exponential equations:

1. Try to get the bases the same.

   If $b^x = b^y$, then $x = y$ $(b > 0, b \neq 1)$

2. Take the logarithm of each side.

   If $a = b$, then $\log a = \log b$ $(a > 0, b > 0)$

Example:

Solve:

$$9^{8-x} = 27^{x-3}$$

Example:

Solve:

$$5\left(\frac{1}{32}\right)^{2x-1} = 40\left(4^{4-2x}\right)$$

Example:

Solve:

$4^{x-1} = 5$

Example:

Solve:

$6e^{-x} = 5\left(2^{2x}\right)$

A logarithmic equation is an equation with a logarithmic expression that contains a variable.

You can solve a logarithmic equation by doing the following:

1. Isolate the logarithm (this may require condensing!!)

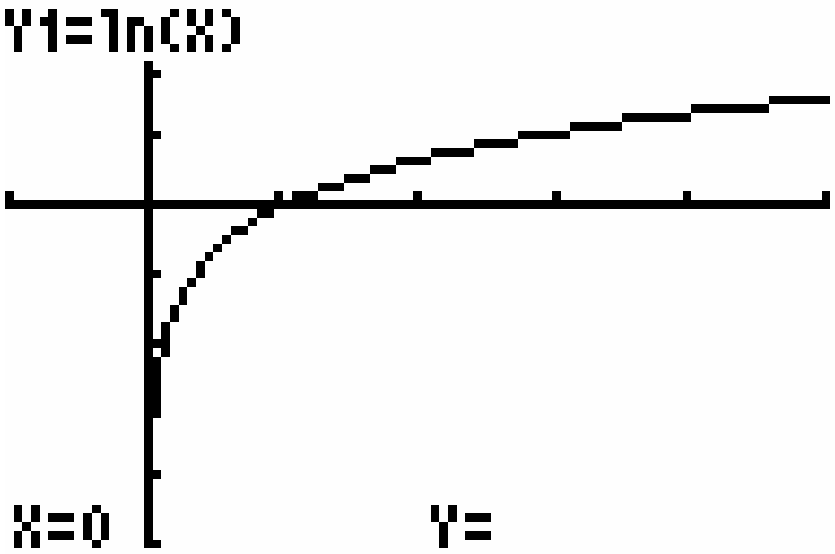
$$\log_b x = a$$

2. Convert it to exponential and solve

$$\log_b x = a$$

$$b^a = x$$

3. Check your solutions: (remember, we can only take logs of POSITIVE numbers!!)



Example:

Solve:

$$2\log_6\left(2x-1\right)=-2$$

Example:

Solve:

$$\log_{12} x+\log_{12}(x+1)=1$$

Example:

Solve:

$\log_4 x^2 = 7$

Example:

Solve:

$\log_4 x^2 = 7$

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Interesting varieties:

Example:

Solve:

$\log_2\left(\log_3 x\right) = -1$

Example:

Solve:

$\ln(x+5) = e^{x-5}$

References:

All images TI-83+ calculator or TI-Interactive Software