

Math 3 Log Guide

Converting Exponential Equation ↔ Log Equation

$$y = a^x \quad \longleftrightarrow \quad x = \log_a y$$

Base Notation

$\log_b x$ has a base of b . $\log x$ has a base of 10. $\ln x$ has a base of e .

Change of Base Formula

$$\log_b a = \frac{\log a}{\log b}$$

Properties for Condensing Logarithms

Property 1: $\log_a 1 = 0$

Property 2: $\log_a a = 1$

Property 3: $\log_a x + \log_a y = \log_a (x y)$

Property 4: $\log_a x - \log_a y = \log_a \left(\frac{x}{y}\right)$

Property 5: $y \log_a x = \log_a x^y$

Steps for Solving Logarithmic Equations Containing Terms without Logarithms

Step 1: If the problem has more than one logarithm on either side of the equal sign then the problem can be simplified. Bring the log terms to the same side of the equation and use the Properties for Condensing Logs above.

Step 2: Rewrite the problem in exponential form.

Step 3: Simplify the problem.

Step 4: Solve for x .

Step 5: Check your answer(s). Remember we cannot take the logarithm of a negative number, so we need to make sure that when we plug our answer(s) back into the original equation we get a positive number. Otherwise, we must drop that answer(s).

Steps for Solving Logarithmic Equations Containing Terms with Logarithms

Step 1: If the problem has more than one logarithm on either side of the equal sign, then each side of the problem must be simplified to one log on each side using Properties for Condensing Logs above.

Step 2: Rewrite the problem without the logarithms.

Step 3: Simplify the problem.

Step 4: Solve for x .

Step 5: Check your answer(s). Remember we cannot take the logarithm of a negative number, so we need to make sure that when we plug our answer(s) back into the original equation we get a positive number. Otherwise, we must drop that answer(s).