Solving Logarithmic Equations

STEPS...

- (1) Write left side & right side as a single logarithm NOTE: $log_a a = 1$
- (2) Set arguments equal & solve the equation
- * (3) Check for extraneous roots

10gw7= log(x+3)

EXAMPLE #1: $\log_3 x - \log_3 4 = \log_3 12$

Chock
for
extraneous,
Root

$$|O_{3}(\frac{x}{4})| = |O_{3}(\frac{x}{2})|$$

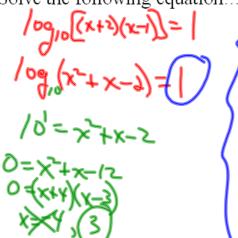
$$|Argument| = |Argument|$$

$$|X = |2|$$

$$|X = 4|8|$$

EXAMPLE #2:

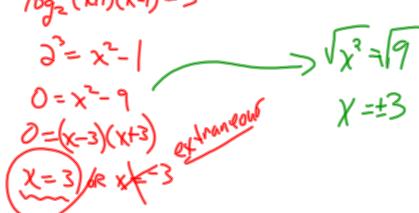
Solve the following equation... $\log_{10}(x+2) + \log_{10}(x-1) = 1$

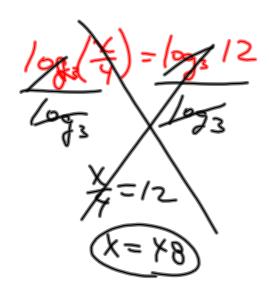


$$\log_{10}(x^{2}+x-2) = \log_{10}(0)$$
 $\therefore x^{2}+x-2=10$

EXAMPLE #3:

Solve: $\log_2(x+1)$ $\log_2(x-1) = 3$





Exponential Equations

What if both sides can not be written to powers of a common base?

Example: $3^{x} = 30$

What would this equation be if expressed as a logarithmic statement?

 $\log_3 30 = x$ Can this be determined using a calculator?

Here is a new method to solve exponential equations...

• Particularly effective when unable to express both sides as a power of a common base

Key property of equations...

• As long as you perform the same operation to BOTH sides of an equation, equality will be maintained

$$3^x = 30$$

Why base 10 or base "e"?

sides...or natural logarithm

Take the common logarithm of both

$$3^{x} = 30$$
 $\log 3^{x} = \log 30$

$$\frac{\chi \log 3 = 10230}{\log 3}$$
 $\chi = 3.096$

Example:
$$6^{2x-3} = 8^{x+1}$$
 $(2x-3)\log 6 = (x+1)\log 8$
 $(2x-3)\log 6 = (x+1)\log 8$
 $(2\log 6)x - 3\log 6 = x\log 8 + \log 8$
 $(2\log 6)x - (\log 8)x = \log 8 + 3\log 6$
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