

# **SOLVING EXPONENTIAL & LOGARITHMIC EQUATIONS**

## **EXPONENTIAL**

**CAN THE BASES BE WRITTEN THE SAME?**

↙  
**NO**

Use natural logarithms to solve.



1. Isolate the exponential expression.
2. Take the natural log of both sides.
3. Simplify using:  
 $\ln b^x = x \ln b$
4. Solve for the variable.

↘  
**YES**

Use the One-to-One Property of Exponents



1. Same base:  $b^M = b^N$
2. Exponents are equal:  
 $M = N$
3. Solve for the variable.

## **LOGARITHMIC**

**WHERE IS THE "UNKNOWN"?**

OUTSIDE THE LOG?

$$\log_b c = M$$

Use the definition of logs to convert. Then solve using the One-to-One Property of Exponents.



INSIDE THE LOG?

$$\log_b M = c$$

$$\log_b M = \log_b N$$

Is there more than one log on one side of the equation?

**NO**

Move onto next step.

**YES**



*Use the product rule or quotient rule to condense the logarithm*

**What does the equation look like?**

$$\log_b M = c$$

where M contains the variable

Use the definition of logarithm:

$$\log_b M = c \rightarrow b^c = M$$



1. Get the log alone.
2. Use definition to convert.
3. Solve for the variable.
4. Check.

$$\log_b M = \log_b N$$

where M & N contain the variable

Use the One-to-One Property of Logarithms



1.  $M = N$
2. Solve for the variable.
3. Check.