Solving Exponential Equations

Name of Method	Method in Symbols	Method in Words	
Relating the bases or One to One Property for Exponential Functions	$b^u = b^v$ u = v	 Requires the exponential equation to have the bases on both sides the same When the bases are the same the exponents must be equal because of the one-to one property of exponential functions. 	
Convert the exponential equation to a logarithmic equation	$y = b^{x}$ $\log_{b} y = x$	 Requires the exponential to be isolated on one side of the equation. Convert to a logarithm using the definition of a logarithm. Solve the remaining equation by isolating x. 	
Take the log of both sides.	$y=b^{x}$ $\ln y = \ln b^{x}$ $\ln y = x \ln b$ $\frac{\ln y}{\ln b} = \frac{x \ln b}{\ln b}$ $\frac{\ln y}{\ln b} = x$	 Requires the exponential to be isolated on one side of the equation. Take the natural log of both sides. This is allowed by the one-to-one property of logarithms. Use the power rule for logarithms to multiply by the exponent. Solve the renaming equation by isolating x. 	

Solve the following exponential equations.

1. $3^{2x-9}=27$	2. $16^{x-3}=8^{x-1}$	3. $3^{x} = 8$	4. $5^{x-3} = 137$
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5.
$$7^{2x+9}=3^{8x+5}$$
 6. $500e^{.05k}+40=1040$ 7. $e^{2x}-2e^{x}-3=0$

Solving Logarithmic Equations

Name of Method	Method in Symbols	Method in Words	
Convert to an Exponential	$y = \log_b x$ $b^y = x$	 Requires the logarithm to be isolated on one side of the equation. Convert to an exponential using the definition of a logarithm. Solve the remaining equation by isolating x. 	
Use the one to one property of Logarithms	$\log_b u = \log_b v$ $u = v$	 Requires the logarithmic equation to have a log with the same base on both sides. When the bases of the logarithms are the same the expressions inside must be equal because of the one-to-one property of logarthmic functions. Solve the remaining equation by isolating x. 	

Solve the following logarithmic equations.

7.	$\log_5(x-4) = \log_5 = 6$	8.	$\log_3 2 + \log_3 (x-3) = \log_3 10$	9.	$\log(x+3) + \log(x-2) = \log 14$
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11. $\log_5(x-5)=2$ 10. $\log_4 x = 3$ 12. $2 \ln x = 8$

13. $\log_2 x + \log_2(x-2) = 3$