Solving Logarithmic Equations

Example 1. Solve for x: $\log (3x - 2) = \log (x + 6)$

Example 2. Solve for x: $\log_4 (x^2 - 9) = 2$

Example 3. **Solve for n; $\log n + \log 5 = 1$**

Example 4.* **Solve for x; $3\log_5 x - \log_5 x = 2$**

Example 5: **Solve for x; $\log (x - 1) + \log (x + 2) = \log_6 6$**

Example 7. **Solve for x; $7^x = 9$**

I clearly cannot make the bases (7 & 9) the same. So, I will take the log of each side. The base does not matter.

ln 7^x = ln 9

x ln 7 = ln 9 **Power Rule**

$$x = \frac{\ln 9}{\ln 7}$$ **Div. Prop =**

$$x = \frac{\ln 9}{\ln 7} = \frac{2.197}{1.945} = 1.129$$ **Look upthose values**

Example 8. Solve for x, $10^{5-x} = 8$

$10^{5-x} = 8$	Given
$\log 10^{5-x} = \log 8$	Take log both sides
$(5-x) \log 10 = \log 8$	Power Rule
$(5-x)(1) = \log 8$	$\log_a a = 1$
$5 - x = \log 8$	
$5 - \log 8 = x$	Subtract Prop =
$5 - .9030 \approx x$	Look up the log 8
$4.0969 \approx x$	

Example 9. Solve for t; $e^{t+6} = 2$

$e^{t+6} = 2$	Given
$\ln e^{t+6} = \ln 2$	Take log
$(t + 6) \ln e = \ln 2$	Power Rule
$(t + 6) 1 = \ln 2$	$\ln e = 1$
$t + 6 = \ln 2$	Dist Prop
$t = \ln (2) - 6$	Sub Prop of =
$t = .0931 - 6$	Look up value
$t \approx -5.3068$	Arithmetic

Example 10 **Solve for y;** $2^{4y+1} - 3^y = 0$

$2^{4y+1} - 3^y = 0$	Given -
$2^{4y+1} = 3^y$	Add Prop =
$\ln 2^{4y+1} = \ln 3^y$	log both sides
$(4y+1)\ln 2 = y\ln 3$	Power Rule
$4y\ln 2 + \ln 2 = y \ln 3$	Distribitive Prop
$4y\ln 2 - y\ln 3 = -\ln 2$	Variables one side; Sub Prop =
$y(4\ln 2 - \ln 3) = -\ln 2$	Factor; Didtributive Prop
$y = \frac{-\ln 2}{4\ln 2 - \ln 3}$	Div Prop =

$$y = \frac{-\ln 2}{4\ln 2 - \ln 3} = \frac{-.6931}{4(.6931) - 1.0986} = .-.41407$$

I chose to take the ln, could have used a log with a different base.