

Solving Logarithmic Equations Examples:

Notes: 1.) Keep answers as (reduced) fractions when possible – if not, ROUND to 3 places! **AT THE END!**

2.) Remember – You CAN NOT take log of a negative number or zero (b/c VA: $x=0$)

Some solutions MAY OR MAY NOT WORK (could also have no solutions)! *✓ Your solution*

When done solving a log equation – Check to see that it works in the original problem!

Logarithmic Equations: Type 1 – Both sides (and every term) is a logarithm

<p>2a.) $\log_5(6-3x) = \log_5(10-5x)$ <i>b/c same base \log_5, you can just drop the logs.</i></p> $6-3x = 10-5x$ $\begin{array}{r} +5x \\ \hline 6+2x = 10 \\ -6 \\ \hline 2x = 4 \\ \hline x = 2 \end{array}$ <p><i>✓ $\log_5(6-3(2)) = \log_5(10-5(2))$ $\log_5(6) = \log_5(6)$ Cannot take log of 0!</i></p> <p><i>only solution that works</i></p>	<p>2b.) $\log(x-3) \oplus \log x = \log 28$ <i>Condense left side to a single log using properties! (Product Property)</i></p> $\log(x-3)(x) = \log 28$ $(x-3)(x) = 28$ $x^2 - 3x = 28$ $x^2 - 3x - 28 = 0$ $(x-7)(x+4) = 0$ $\begin{array}{l} x-7=0 \\ x+4=0 \end{array} \quad \{7\}$ <p><i>Solve the quadratic!</i></p> <p><i>✓ $x=7$ $x=-4$</i></p> <p><i>Will give you the log of a negative!</i></p>	<p>2c.) $\ln(2x+1) - \ln(x-1) = \ln 7$</p> $\ln\left(\frac{2x+1}{x-1}\right) = \ln 7$ $\frac{2x+1}{x-1} = \frac{7}{1}$ $2x+1 = 7(x-1)$ $2x+1 = 7x-7$ $-5x+1 = -7$ $-5x = -8$ $x = \frac{8}{5}$ <p><i>{8/5} ✓</i></p>
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Logarithmic Equations: Type 2 – SINGLE LOG on one side and a CONSTANT on the other side

<p>2d.) $\log_3(2x+15) = 2$ <i>* Rewrite as an exponential!</i></p> $3^2 = 2x+15$ $9 = 2x+15$ $-6 = 2x$ $x = -3$ <p><i>{-3}</i></p>	<p>2e.) $\log_2 x + \log_2(x-2) = 3$ <i>condense the log!</i></p> $\log_2(x)(x-2) = 3$ <p><i>Rewrite as exponential</i></p> $2^3 = x(x-2)$ $8 = x^2 - 2x$ $0 = x^2 - 2x - 8$ $0 = (x-4)(x+2)$ $\begin{array}{l} x-4=0 \\ x+2=0 \end{array} \quad \{4\}$ <p><i>Solve the quadratic!</i></p> <p><i>✓ $x=4$ $x=-2$</i></p>	<p>2f.) $4 - 6\ln(3x-1) = -20$</p> $-6\ln(3x-1) = -24$ $\ln(3x-1) = 4$ $3x-1 = e^4$ $3x = \frac{e^4 + 1}{3}$ $x = \frac{e^4 + 1}{3}$ <p><i>{18.533} ✓</i></p>
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Methods to Solve Quadratics

- Quadratic Formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

- Factoring w/ ZPP

- Square rt Property

- Complete the Square

- Graphing

$$x^2 - 25 = 0$$