

U4 Day 4 - Solve Log EQ

Warm Up: find the inverse

① $y = 3 \log_5(2x-1) + 4$ ② $y = (5^x - 7)^{1/4}$

SWBAT: Use Log Properties to solve log EQ.

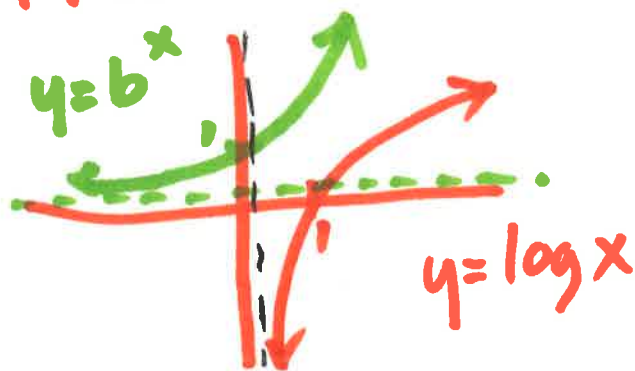
To Solve a log EQ:

- ① get all logs on one side of EQ.
- ② condense into one single log
- ③ Isolate the log
- ④ Exponentiate
- ⑤ solve for x

Extraneous Roots!

(solutions that don't work)

$$x > 0$$



ex 1 (Easy)

$$\log(6x) - 3 = -4$$

$$\log_{10} 6x = -1$$

$$\frac{10^{-1}}{6} = \frac{6x}{6}$$

$$x = \frac{1}{60}$$

$$\text{ex 2. } \frac{3}{3} \log_{10}(x^2 + 1) = \frac{5}{3}$$

$$\pm \sqrt{10^{5/3} - 1} = \sqrt{x^2 + 1}$$

$$\pm 6.74 \approx x$$

ex 3. (medium)

$$\log(7x-2) = \log(3x+5) \quad \left\{ \begin{array}{l} x = 3x-1 \\ 2 = 2 \end{array} \right.$$

$$\begin{array}{r} 7x-2 = 3x+5 \\ -3x \quad +2 \quad -3x \\ \hline \end{array}$$

$$4x = 7$$

$$x = \frac{7}{4}$$

ex 4. $\log 2x - \log 3x = 7$

$$\log \frac{2x}{3x} \neq 7$$

no sol

ex. 5

$$\textcircled{5} \log (x+1) + \log 4 = -2$$

$$\log_{10} 4(x+1)^5 = -2$$

$$\frac{10^{-2}}{4} = 4(x+1)^5$$

$$\left(\frac{10^{-2}}{4}\right)^{1/5} = \left(4(x+1)^5\right)^{1/5}$$

$$\left(\frac{10^{-2}}{4}\right)^{1/5} = x+1$$

$$x \approx -1.10$$

ex 6. (more complicated)

$$\log(4x-5) - \log(2x-1) = 4$$

$$\log \frac{(4x-5)}{(2x-1)} = 4$$

$$\left\{ \begin{array}{l} \cancel{x(4x-5)} \\ \cancel{x(2x-1)} \end{array} \right.$$

$$(2x-1)10^4 = \frac{4x-5}{\cancel{(2x-1)}} (2x-1)$$

$$\begin{array}{r} 20,000x - 10,000 \\ -4x \quad +10,000 \end{array} = \begin{array}{r} 4x - 5 \\ -4x \quad +10,000 \end{array}$$

$$\frac{\cancel{19996}x}{\cancel{19996}} = \frac{9995}{19996}$$

$$x \approx .50$$

$$\text{ex 7. } \log_5 6 + \log_5 2x^2 = \log_5 48$$

$$\log_5 6 + \log_5 2x^2 - \log_5 48 = 0$$

$$\log_5 \frac{6(2x^2)}{48} = 0$$

$$\left\{ \frac{12x^2}{48} \right.$$

$$\log_5 \frac{x^2}{4} = 0$$

$$4 \cdot 5^0 = \frac{x^2}{4}$$

$$\pm \sqrt{4} = \sqrt{x^2}$$

$$\boxed{\pm 2 = x}$$