Warm Up

Find the value of x.

1. $\log_{10} x - 2 = 0$

2. $\ln(3x+5) = 3$

3. $2\log_3(x-5) + 4 = 10$

4. $\frac{2}{5} \cdot 2^{x+5} - 5 = 1$

1. $x = 100$
2. $x = 5.03$
3. $x = 32$
4. $x = -1.09$

Section 3.4 Day 3	Solve Log Equations
Objective	Given a log equation students will use the definition of logarithms to solve for the value of x.

Study Problems

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Example

Find the value of x.

$$\frac{1}{2}\ln\sqrt{x-10}=3$$

$$\frac{\frac{1}{2}\ln\sqrt{x-10}}{\frac{1}{2}}=\frac{3}{\frac{1}{2}}$$

$$\ln\sqrt{x-10}=6$$

$$e^6=\sqrt{x-10}$$

$$403.43^2=\sqrt{x-10}^2$$

$$162{,}754.79=x-10$$

$$\boxed{x=162{,}764.79}$$

What do we do different in this one:

$$\frac{1}{2}\ln(x-10)=3$$

$x=413.43$

Check: $\frac{1}{2}\ln\sqrt{162764.79-10}$

Example

Find the value of x.

$$\ln x+\ln 5=25$$

$7.20\ldots E\ 10$

7.20×10^{10}

$$\ln 5x=25$$

$$e^{25}=5x$$

$$\frac{7.20\times10^{10}}{5}=\frac{5x}{5}$$

$$\boxed{x=1.44\times10^{10}}$$

What is the second step to solve log equations?

Example

Find the value of x.

$$\log_4 2 + \log_4 x = 2$$

What is the first step to solve log equations?

$\log_4 2x = 2$

$4^2 = 2x$

$16 = 2x$

$x = 8$

Check

$\log_4 2 + \log_4 8$

$\frac{\log 2}{\log 4} + \frac{\log 8}{\log 4}$

Example

Find the value of x.

$$\log_2 x - \log_2(x+4) = 1$$

Check

$\cancel{\log_2(-8)}$

Argument can never be neg.

$\log_2 \frac{x}{x+4} = 1$

$2^1 = \frac{x}{x+4}$

$\frac{2}{1} = \frac{x}{x+4}$

$2(x+4) = 1(x)$

$2x + 8 = x$

$\boxed{\cancel{x = -8}}$ No Soln

Example

Find the value of x.

$$\log_4 x - \log_4(x-2) = 2$$

$$\log_4 \frac{x}{x-2} = 2$$

$$4^2 = \frac{x}{x-2}$$

$$\frac{16}{1} = \frac{x}{x-2}$$

$$16(x-2) = 1(x)$$

$$16x - 32 = x$$

$$15x = 32$$

$$x = \frac{32}{15}$$