SUN | MON | TUE

Name: _____ Date: _____ Class: _____

Solving Exponential and Logarithmic Equations 3

Property of Equality for Logarithmic Equations: If $\log_b x = \log_b y$, then $x = y$.

In other words, when there is one Logarithm on the left, and one Logarithm on the right, then then you can equal the Logarithmic arguments.

Ex. 1 Solve by using properties of logarithms.

Solve: $\log_7(x-8) + \log_7(2) = \log_7(x-1)$

$\log_7 2(x-8) = \log_7 x-1$

$2(x-8) = x-1$

$2x-16 = x-1$

$-x \quad -x$

$x-16 = -1$

$+16 \quad +16$

$\boxed{x = 15}$

Solve: $\log(5x+2) = \log(x+1) + \log(2) + \log(3)$

$\log(5x+2) = \log 6(x+1)$

$5x+2 = 6(x+1)$

$5x+2 = 6x+6$

$-5x \quad -5x$

$2 = x+6$

$-6 \quad -6$

$\boxed{-4 = x}$

YOU TRY!

Solve: $\log_8(2x+3) + \log_8(4) = \log_8(4-x)$

$\log_8 4(2x+3) = \log_8(4-x)$

$8x+12 = 4-x$

$+x \quad +x$

$9x+12 = 4$

$-12 \quad -12$

$\frac{9x}{9} = \frac{-8}{9}$

$\boxed{x = -8/9}$

Ex. 2 Solve by using properties of logarithms.

Solve: $\log_2(2x+3) - \log_2(5) = \log_2(x+1)$

$\log_2\left(\frac{2x+3}{5}\right) = \log_2(x+1)$

$5 \cdot \frac{2x+3}{5} = (x+1)5$

$2x+3 = 5x+5$

$-2x \quad -2x$

$3 = 3x+5$

$-5 \quad -5$

$\frac{-2}{3} = \frac{3x}{3}$

$\boxed{x = -2/3}$

Solve: $\log(2x+1) - \log(x) = \log(3) + \log(4)$

$\log\left(\frac{2x+1}{x}\right) = \log(12)$

$x \cdot \frac{2x+1}{x} = 12 \cdot x$

$2x+1 = 12x$

$-2x \quad -2x$

$\frac{1}{10} = \frac{10x}{10}$

$\boxed{x = 1/10}$

YOU TRY!

Solve: $\log(x+1) - \log(10) = \log(10)$

Ex. 3 Solve by using properties of logarithms.

Solve: $\log_3(2x-1) + \log_3(4) = 1$

$\log_3 4(2x-1) = 1$

$3^1 = 4(2x-1)$

$3 = 8x-4$

$+4 \quad +4$

$\frac{7}{8} = \frac{8x}{8}$

$\boxed{x = 7/8}$

Solve: $\log(x+2) - \log(2x) = 2$

$\log_{10}\left(\frac{x+2}{2x}\right) = 2$

$10^2 = \frac{x+2}{2x}$

$2x \cdot 100 = \frac{x+2}{2x} \cdot 2x$

$200x = x+2$

$-x \quad -x$

$\frac{199x}{199} = \frac{2}{199}$

$\boxed{x = \frac{2}{199}}$

YOU TRY!

Solve: $\log_2(3) + \log_2(2x) = 3$

$\log_2 3(2x) = 3$

$2^3 = 6x$

$\frac{8}{6} = \frac{6x}{6}$

$\boxed{x = 4/3}$

Solve: $\log_2(2x+3) - \log_2(x) = 3$