Name: ____________________ Date: ____________________ Class: ________

Solving Exponential and Logarithmic Equations 2

Exponential equations are equations in which variable expressions occur as exponents.

Logarithmic equations are equations that involve logarithms of variable expressions.

Property of Equality for Logarithmic Equations

If b, x, and y are positive numbers with $b \neq 1$, then $\log_b x = \log_b y$ if and only if $x = y$.

Ex. 1 Solve a logarithmic equation

Solve: $\log_7(6x - 16) = \log_7(x - 1)$

$6x - 16 = x - 1$
$-x \quad -x$
$5x - 16 = -1$
$+16 \quad +16$
$\frac{5x}{5} = \frac{15}{5}$
$\boxed{x = 3}$

Solve: $\log(11) = \log(x^2 + 2)$

$11 = x^2 + 2$
$-2 \quad -2$
$\sqrt{9} = \sqrt{x^2}$
$\boxed{x = \pm 3}$

YOU TRY!

Solve: $\ln(7x - 13) = \ln(2x + 17)$

$7x - 13 = 2x + 17$
$-2x \quad -2x$
$5x - 13 = 17$
$+13 \quad +13$
$\frac{5x}{5} = \frac{30}{5}$
$\boxed{x = 6}$

Solve: $\log_8(x + 6) = \log_8(4 - x)$

$x + 6 = 4 - x$
$+x \quad +x$
$2x + 6 = 4$
$-6 \quad -6$
$\frac{2x}{2} = \frac{-2}{2}$
$\boxed{x = -1}$

Identity property of Logarithms

If $b \neq 0$ and $\log_a b = c$, then $a^c = b$

Ex. 2 Rewrite the logarithmic function as an exponential function to solve the equation.

Solve: $\log_5(3x - 8) = 2$

$5^2 = 3x - 8$
$25 = 3x - 8$
$+8 \quad +8$
$\frac{33}{3} = \frac{3x}{3}$
$\boxed{x = 11}$

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

$2^3 = 2x + 5$
$8 = 2x + 5$
$-5 \quad -5$
$\frac{3}{2} = \frac{2x}{2}$
$\boxed{x = 3/2}$

YOU TRY!

Solve: $\log_3(2x + 9) = 3$

$3^3 = 2x + 9$
$27 = 2x + 9$
$-9 \quad -9$
$\frac{18}{2} = \frac{2x}{2}$
$\boxed{x = 9}$

Solve: $\log_4(10x + 624) = 5$