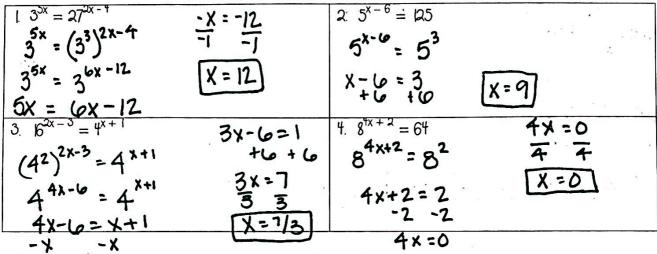# SOLVING EXPONENTIAL EQUATIONS

Name: **Burden**
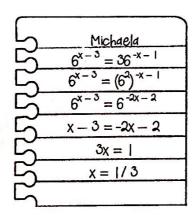
Date: _____ Period: _____

Directions: Solve the following exponential equations using the following information.

Property of Equality
Let $b > 0$. Then $b^x = b^y$ if and only if $x = y$

---

1. $3^{5x} = 27^{2x-4}$

$3^{5x} = (3^3)^{2x-4}$

$3^{5x} = 3^{6x-12}$

$5x = 6x - 12$

$\dfrac{-x}{-1} = \dfrac{-12}{-1}$

$\boxed{x = 12}$

2. $5^{x-6} = 125$

$5^{x-6} = 5^3$

$\begin{array}{c} x - 6 = 3 \\ +6 \quad +6 \end{array}$

$\boxed{x = 9}$

3. $16^{2x-3} = 4^{x+1}$

$(4^2)^{2x-3} = 4^{x+1}$

$4^{4x-6} = 4^{x+1}$

$\begin{array}{c} 4x - 6 = x + 1 \\ -x \qquad -x \end{array}$

$\begin{array}{c} 3x - 6 = 1 \\ +6 \quad +6 \end{array}$

$\dfrac{3x}{3} = \dfrac{7}{3}$

$\boxed{x = 7/3}$

4. $8^{4x+2} = 64$

$8^{4x+2} = 8^2$

$\begin{array}{c} 4x + 2 = 2 \\ -2 \quad -2 \end{array}$

$4x = 0$

$\dfrac{4x}{4} = \dfrac{0}{4}$

$\boxed{x = 0}$

Error Analysis Michaela & Nadeine are solving $6^{x-3} = 36^{-x-1}$. Is either of them correct? Explain your reasoning.

Michaela

$6^{x-3} = 36^{-x-1}$

$6^{x-3} = (6^2)^{-x-1}$

$6^{x-3} = 6^{-2x-2}$

$x - 3 = -2x - 2$

$3x = 1$

$x = 1/3$

★ (crossed out)

Nadeine

$6^{x-3} = \cancel{36^{-x-1}}$

$6^{x-3} = (6^2)^{-x-1}$

$6^{x-3} = 6^{-x+1}$

$x - 3 = -x + 1$

$2x = 4$

$x = 2$

X (crossed out)

power to a power means multiply

Articulate A classmate of yours is having difficulty solving the following exponential equation and asks for your help in solving it. In your own words, how would you explain the process for solving the problem?

$9^{3x+1} = 27^{3x-1}$

$(3^2)^{3x+1} = (3^3)^{3x-1}$

$3^{6x+2} = 3^{9x-3}$

$6x + 2 = 9x - 3$

$\begin{array}{c} -6x + 3 \quad -6x + 3 \end{array}$

$5 = 3x$

$\boxed{x = 5/3}$

EX. $5^{-2x+1} = \frac{1}{25}$

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

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

$5^{-2x+1} = 5^{-2}$

$\begin{array}{cc} -2x+1 = -2 \\ -1 \quad\quad -1 \end{array}$

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

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

EX. $5^{-k+2} = 5^{1-k}$

no sol.

$\begin{array}{cc} -k+2 = 1-k \\ +k \quad\quad +k \end{array}$

$2 = 1 \rightarrow \text{no solution!}$

EX. $\left(\frac{1}{4}\right)^{-n} = 64^{-2n}$

$n = 0$

$\left(\frac{4^{-1}}{1}\right)^{-n} = 64^{-2n}$

$4^n = 64^{-2n}$

$4^n = \left(4^3\right)^{-2n}$

$4^n = 4^{-6n}$

$\begin{array}{cc} n = -6n \\ +6n \quad +6n \end{array}$

$\dfrac{7n}{7} = \dfrac{0}{7}$

$\boxed{n = 0}$