

Solving Exponential Equations

* When you have a power raised to a power you multiply exponents *

TO SOLVE:

① Make like bases

② Set exponents equal to each other

③ Solve for variable (x)

Examples:

$$\textcircled{1} 5^{2x} = 5^{4x+4}$$

$$2x = 4x + 4$$

$$\begin{array}{r} 2x = 4x + 4 \\ -4x \quad -4x \\ \hline -2x = 4 \\ \frac{-2x}{-2} = \frac{4}{-2} \end{array}$$

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

$$\textcircled{2} 2^{x+6} = 16^{2x}$$

$$2^{x+6} = (2^4)^{2x}$$

$$2^{x+6} = 2^{8x}$$

$$\begin{array}{r} x+6 = 8x \\ -x \quad -x \\ \hline \end{array}$$

$$\frac{6}{7} = \frac{7x}{7}$$

$$\boxed{x = \frac{6}{7}}$$

$$\textcircled{3} 7^{x+1} = \left(\frac{1}{49}\right)^{2x-5}$$

$$7^{x+1} = (7^{-2})^{2x-5} \quad \# \quad \underline{x+1 = -2(2x-5)}$$

$$7^{x+1} = 7^{-4x+10}$$

$$\begin{array}{r} x+1 = -4x+10 \\ +4x \quad +4x \\ \hline \end{array}$$

$$5x+1 = 10$$

$$\begin{array}{r} -1 \quad -1 \\ \hline 5x = 9 \\ \frac{5x}{5} = \frac{9}{5} \end{array}$$

$$\boxed{x = \frac{9}{5}}$$

$$\textcircled{4} \quad 6^{4x+2} = \left(\frac{1}{216}\right)^{x-4}$$

$$6^{4x+2} = (6^{-3})^{x-4}$$

$$\cancel{6}^{4x+2} = \cancel{6}^{-3x+12}$$

$$4x+2 = -3x+12$$

$$\begin{array}{r} +3x \quad \quad +3x \\ \hline \end{array}$$

$$7x+2=12$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \end{array}$$

$$\frac{7x}{7} = \frac{10}{7}$$

$$\boxed{x = \frac{10}{7}}$$

$$\textcircled{5} \quad 9^{5x} = 27^{x-2}$$

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

$$\cancel{3}^{10x} = \cancel{3}^{3x-6}$$

$$10x = 3x-6$$

$$\begin{array}{r} -3x \quad -3x \\ \hline \end{array}$$

$$\frac{7x}{7} = \frac{-6}{7}$$

$$\boxed{x = \frac{-6}{7}}$$

$$= -\frac{6}{7}$$