

Solving Exponential Equations with One to One Property Notes

Name _____

Date _____

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

Logarithmic equations are equations that involve logarithms of variable expressions.

$$5^{-1} = \frac{1}{5}$$

Solve by equating exponents

Ex. 1: $3^x = 3^{2x-4}$

$$\begin{aligned} x &= 2x - 4 \\ -2x & \quad -2x \\ \hline -x &= -4 \\ \frac{-x}{-1} &= \frac{-4}{-1} \\ \boxed{x=4} \end{aligned}$$

Ex. 2: $8^x = 4^{x+1}$

$$\begin{aligned} (\cancel{2^3})^x &= (\cancel{2^2})^{x+1} \\ 3x &= 2x + 2 \\ -2x & \quad -2x \\ \hline \boxed{x=2} \end{aligned}$$

Ex. 3: $\frac{1}{5}^x = 25^{x+2}$

$$\begin{aligned} (\cancel{5^{-1}})^x &= (\cancel{5^2})^{x+2} \\ -x &= 2x + 4 \\ -2x & \quad -2x \\ \hline -3x &= 4 \\ \frac{-3x}{-3} &= \frac{4}{-3} \\ \boxed{x = -\frac{4}{3}} \end{aligned}$$

YOU TRY!

Solve: $5^{3x} = 5^{4x+1}$

$$\begin{aligned} 3x &= 4x + 1 \\ -4x & \quad -4x \\ \hline -x &= 1 \\ \frac{-x}{-1} &= \frac{1}{-1} \\ \boxed{x=-1} \end{aligned}$$

Solve: $64^x = 16^{x+1}$

$$\boxed{x = \frac{3}{11}}$$

Solve: $3^{7x-3} = \frac{1}{9}^{2x}$

$$\begin{aligned} 7x-3 &= (-2) \cdot 2x \\ 7x-3 &= -4x \\ -7x & \quad -7x \\ \hline -3 &= -11x \\ \frac{-3}{-11} &= \frac{-11x}{-11} \end{aligned}$$

Ex. 4: $\frac{5(3^x)}{5} = \frac{405}{5}$

$$\begin{aligned} 3^x &= 81 \\ \cancel{3^x} &= \cancel{3^4} \\ \boxed{x=4} \end{aligned}$$

Ex. 5: $4^x - 10 = 6$

$$\begin{aligned} &+10 \quad +10 \\ 4^x &= 16 \\ \cancel{4^x} &= \cancel{4^2} \\ \boxed{x=2} \end{aligned}$$

Ex. 6: $\frac{1}{9}^x = \frac{1}{27}^{x+2}$

$$\begin{aligned} (-2)^x &= (-3)^{x+2} \\ -2x &= -3x - 6 \\ +3x & \quad +3x \\ \hline \boxed{x = -6} \end{aligned}$$

YOU TRY!

Solve: $4(2^{2x}) = 32$

Solve: $5^{x-4} + 8 = 133$

Solve: $\frac{1}{4}^{7x-3} = \frac{1}{8}^{12x}$