Note-taking Guide: **Solving Exponential Equations**

Step 1: Make the bases the ____________ using the properties of ____________.

Step 2: ____________ the bases and set the exponents ____________ to each other.

Step 3: Solve the equations

Step 4: Check your work

Review: Properties of exponents

\[
\begin{align*}
\text{Product property:} & \quad (b^x)(b^y) = b^{x+y} \\
\text{Quotient property:} & \quad (b^x)/(b^y) = b^{x-y} \\
\text{Power of a power property:} & \quad (b^x)^y = b^{xy} \\
\text{Negative exponents:} & \quad b^{-x} = 1/b^x \\
\text{Rational exponents:} & \quad b^{xy} = \sqrt[y]{b^x}
\end{align*}
\]

**Example 1:**

\[
2^{x-1} = 2^{2x - 5}
\]

Since the bases are the same, solve the equation

\[
x - 1 = 2x - 5
\]

\[
x = _____
\]

Check your work
Example 2:

\[ 3^{x+9} = 9^4 \]

Make the bases the same by make 9 with base 3. \( 9 = 3^2 \)

\[ 3^{x+9} = (3^2)^4 \]

Apply the power of a power property

\[ 3^{x+9} = 3^8 \]

Drop the bases and solve for \( x \).

\[ x = \]

Check your work:

Example 3:

\[ \frac{1}{100} = (10)^{x^2-6} \]

Make the bases the same by applying negative exponents and power of a power property to the left side

Drop the bases and solve for \( x \).
Example 4:

\[(\sqrt{5})^{4x-12} = 125^{x+5}\]

Make the bases the same by applying rational exponents to the left side, and power of a power property to the right side.

Drop the bases and solve for \(x\).

\[x = \underline{\hspace{2cm}}\]

Check your work: