

1 Section 4.5 Exponential and Logarithmic Equations

If a variable appears in an exponent of a term of an equation, then the equation is called an **exponential equation**.

If $b^x = b^y$, then $x = y$, provided that $b > 0$ and $b \neq 1$.

Example 1 Use the Equality of Exponents Theorem to solve: 1) $3^{x-2} = 81$ 2) $2^{x+3} = \frac{1}{2}$ 3) $9^x = \frac{1}{243}$

Example 2 Solve: 1) $8^x = 800$ 2) $4^{3x+2} = 3^{2x+3}$ 3) $\frac{3^x + 3^{-x}}{4} = 3$.

Equations that involve logarithms are called **logarithmic equations**. The properties of logarithms, along with the definition of a logarithm, are often used to find the solutions of a logarithmic equation.

Example 3 Solve: 1) $\log(9x+1) = 3$ 2) $\log x + \log(x+15) = 2$ 3) $\ln(2x+3) = \ln(4x+6) - \ln(x-1)$ 4) $\log(\log x) = 1$.