There are two basic strategies for solving exponential and logarithmic equations. The first is based on the One-to-One Properties. The second is based on the Inverse Properties. For a > 0 and $a \ne 1$, the following properties are true for all x and y for which $\log_a x$ and $\log_a y$ are defined.

One-to-One Properties

$$Q^{x} = Q^{y} \text{ if and only if } x=y$$

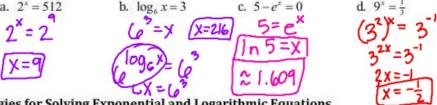
Inverse Properties

 $Q^{\log_{a} x} = x$
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Solving Simple Equations

Example:

1. Solve each equation for x.



Strategies for Solving Exponential and Logarithmic Equations

- 1. Rewrite the original equation in a form that allows the use of the One-to-One Properties of exponential or logarithmic functions.
- 2. Rewrite an exponential equation in logarithmic form and apply the Inverse Property of logarithmic functions.
- 3. Rewrite a logarithmic equation in exponential form and apply the Inverse Property of exponential functions.

Solving Exponential Equations

Examples:

2. Solve each equation and approximate the result to three decimal places, if necessary.

a.
$$e^{2x} = e^{x^2-8}$$

 $2x = x^2-8$
 $0 = x^2-2x-8$
 $0 = (x-4)(x+2)$
b. $\frac{2(5^x)}{2} = \frac{32}{2}$
 $5^x = 16$
 $\log_5 16 = x$
 $x = \frac{\log_5 16}{\log_5 5} \approx 1.723$

3. Solve $e^x - 7 = 23$ and approximate the result to three decimal places.

$$e^{x} = 30$$

In 30 = X
 $\chi \approx 3.401$

