Solving Exponential and Logarithmic Equations

College Algebra

Overview

1. Inverse Properties of Logarithms and Exponential Functions
2. Solving Exponential Equations
3. Solving Logarithmic Equations

Inverse Properties of Logarithms and Exponential Functions

For all x

$$\log_b b^x = x.$$

For $x > 0$

$$b^{\log_b x} = x.$$

How To - Solve Exponential Equations

To solve an equation containing an exponential expression:

1. Isolate the exponential expression.
2. Take the logarithm of both sides. Use the same base for the logarithm as the exponential expression.
3. Cancel the logarithm and exponential expression using the Inverse Property.
4. Solve the resulting equation.

Example 1

Solve the equation. Round your answer to three decimal places where appropriate.

$$4 \cdot 9^{2x} = 14$$

Example 2

Solve the equation. Round your answer to three decimal places where appropriate.

$$10^{2x-18} + 12 = -3$$

How To - Solve Logarithmic Equations

To solve an equation containing a logarithm:

1. Isolate the logarithmic expression.
2. Use both sides as an exponent in an exponential expression. Use the same base for the exponential expression as the logarithm.
3. Cancel the exponential expression and logarithm using the Inverse Property.
4. Solve the resulting equation.

Example 3

Solve the equation. Round your answer to three decimal places where appropriate.

$$2 \cdot \log(6x) + 16 = 14$$

Example 4

Solve the equation. Round your answer to three decimal places where appropriate.

$$\log_8 (3x - 18) = 3$$