Section 10.7 Exponential and Logarithmic Equations and Applications

# Objective 1: Solving Exponential Equations

In section 10.3, we solved exponential equations that were written, or could be written, in the form by applying the uniqueness of . For example,

We were able to solve the equation in this manner because can be written as a power of . But consider the equation . It is not possible to write as raised to a rational exponent, so we need a new technique for solving exponential equations.

To solve equations such as , we use the fact that is a one-one-one function. This leads us to the **logarithm property of equality**.

**Logarithm Property of Equality:**

Let and be real numbers such that and are real numbers and . Then

 is equivalent to .

Solve the equation. Give the exact solution and then approximate the solution to four decimal places.

|  |  |
| --- | --- |
| a.  | b.  |

|  |  |
| --- | --- |
| c.  | d.  |

# Objective 2: Solving Logarithmic Equations

By applying the appropriate properties of logarithms, we can solve a variety of logarithmic equations. Because of the domain restriction of the logarithm, you must always check the solution(s) to a logarithmic equation.

Solve each equation.

|  |  |
| --- | --- |
| a.  | b.  |

|  |  |
| --- | --- |
| c.  | d.  |

e. Solve for . Give the exact solution and then approximate the solution to four decimal places.

# Objective 3: Solving Problems Modeled by Exponential and Logarithmic Functions

Now that we know how to solve exponential and logarithmic equations, we can solve a wider variety of problems given a situation that can be modeled by an exponential or a logarithmic function.

The population of a city is increasing at a rate of per year. The current population is . The population in thousands years from now can be modeled by the function .

a. What will the population be in years?

b. How many years will it take for the population to reach ?

Consider an investment made at an annual interest rate of . How long will it take the investment to double if the interest is compounded:

c. monthly

d. continuously