Section 10.4 Logarithmic Functions

# Objective 1: Using Logarithmic Notation

Every exponential function of the form where and is a one-to-one function and thus has an inverse function. The graph of for and its inverse, are shown below.



To find the equation of , recall from section 10.2 that we interchange the and in the equation of and then solve for . So the equation of the inverse function is

.

At this point, we are stuck. To solve this equation for , a new notation, the **logarithmic function**, is needed. The expression means “the power to which is raised in order to produce a result of . The expression is read “log base of .”

**Logarithmic Definition:**

If and , then

means

for every and every real number .

a. Complete the table by writing the corresponding equation in each row**.**

|  |  |
| --- | --- |
| **Exponential Equation** | **Logarithmic Equation**  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

# Evaluate each logarithm.

|  |  |
| --- | --- |
| b.  | c.  |
| d.  | e.  |
| f.  | g.  |
| h.  | i.  |

# Objective 2: Solving Logarithmic Equations

The ability to interchange the logarithmic and exponential forms of a statement is often the key to solving logarithmic equations.

Solve for x.

|  |  |
| --- | --- |
| a.  | b.  |
| c.  | d.  |

# Objective 3: Graphing Logarithmic Functions

A **logarithmic function** is a function that can be defined by where is a positive real number and . The domain of is the set of positive real numbers, and the range of is the set of real numbers.

a. Consider the function Complete the table and graph . Then fill in the missing information about and its graph.

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |

Domain:

Range:

-intercept:

Vertical asymptote:

b. Consider the function Complete the table and graph . Then fill in the missing information about and its graph.

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |

Domain:

Range:

-intercept:

Vertical asymptote: