Section 10.6

Common Logarithms, Natural Logarithms, and Change of Base

# Objective 1: Approximating Common Logarithms

We know from section 10.4 that the base of a logarithm can be any number such that and . There are two logarithmic bases that are used most commonly in mathematics and science applications. Because these bases are used so frequently, these logarithms have special names.

The first one we are going to explore is the **common logarithm** which is a logarithm with a base of . Sometimes the base is not written when working with a common logarithm. The notation is understood to mean The log button on a scientific calculator is the common logarithm.

Use a calculator to approximate the value of each logarithm to four decimal places.

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

# Objective 2: Evaluating Common Logarithms of Powers of

To evaluate a common logarithm of a power of , a calculator is not needed.

Evaluate each logarithm without using a calculator.

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

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

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

# Objective 3: Approximating Natural Logarithms

The second frequently used type of logarithm is the **natural logarithm** which is a logarithm with a base of . The notation is usually used to denote The ln button on a scientific calculator is the natural logarithm.

Use a calculator to approximate the value of each logarithm to four decimal places.

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

# Objective 4: Evaluating Natural Logarithms of Powers of

To evaluate a natural logarithm of a power of , a calculator is not needed.

Evaluate each logarithm without using a calculator.

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

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

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

# Objective 5: Using the Change of Base Formula

The change of base formula allows us to rewrite a logarithm using a different base of our choice. This can be useful when we want to use a calculator to evaluate logarithms of bases other than or .

**Change of Base Formula:**

If , , and are positive real numbers and neither nor is , then

.

Use the change of base formula to approximate to four decimal places.