**PreCalculus 3.2 Logarithmic Functions and their Graphs**

**Logarithmic Function**

Logarithmic Form Exponential Form

→

Example: Evaluate each logarithm at the indicated value of *x*.

when

→

when

when

**Common Logarithms**

Examples:

**Properties of Logarithms**

If ,

then

Examples using logarithmic properties:

**Graphs of Logarithmic Functions**

**Graph of Logarithmic Function**

points of the graph

this is an increasing function

*y*-axis is a horizontal asymptote

Domain:

Range: all real numbers

This is a continuous function

points of the graph

this is an decreasing function

*y*-axis is a horizontal asymptote

Domain:

Range: all real numbers

This is a continuous function

This graph is a reflection of the graph of over the *x*-axis – so the point is also on the graph.

**Transformations of Logarithmic Graphs**

Example:

Example:

Example:

**Natural Logarithmic Function**

Examples:

when

when

when

**Logarithmic Form to Exponential Form**

**Properties of Natural Logarithms**

because

because

because

If , then

Examples:

**Graphs of Natural Logarithms**

**Finding the domain of a Logarithmic Function**  (Remember that you can’t take the log of a negative number)

**Applications**

*Students in a pre-calculus class were given an exam and then were retested monthly with an equivalent exam. The average scores for the class are given by the human memory model.*

*t* is the time in months

What was the average score on the original exam? ()

What was the average score after 3 months?

What was the average score after 11 months