**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