**7.3 Logarithmic Functions as Inverses  
Objective: To write and evaluate logarithmic expressions  
To graph logarithmic functions**

**Definition of Logarithm with Base b**;

*logby and is defined as follows*:

* **logby = x ⇔ bx = y**

(The expression logby is read as “log base b of y”)

**Logarithmic Form**: logby = x

**Exponential Form**: bx = y

(Given the equation in one of these forms, you can always rewrite it in the other form)

*Examples:*

*Rewrite the equation in exponential form*

log232 = 5 log51 = 0 log10511,025 = 2

**Common Logarithm**: the logarithm with base 10

(denoted by: log10, or simply log)

* **log10x = log x**

**Natural Logarithm**: the logarithm with base e (denoted by: loge)

* **logex = ln x**

**Special Logarithm Values**;

* **Logarithm of 1**: logb1 = 0 because b0 = 1
* **Logarithm of Base b**: logbb = 1 because b1 = b

*Evaluate the expression:*

log381 log93

 log44-0.38

log71 log1/416

Use your calculator to evaluate the following:

log 9 log √3

ln 12 log 5.32

ln (2/3) log -2

**Finding inverses**: switch x and y values, then solve for new y

g(x) = logbx is the inverse of the exponential function f(x) = bx

* + g(f(x)) = logbbx = x
  + f(g(x)) = blogbx = x

Exponential and logarithmic functions “undo” each other

*Examples:*

*Simplify the Expression*

10log2 log39x

*Find the inverse of the function*

y = log3x y = ln (x + 1)

y = log864x y = ln 6x

**Graphs of Logarithmic Functions**; *y = logb(x – h) + k*

* Vertical Asymptote: x = h
* Domain: x > h
* Range: all real numbers
* If b > 1, the graph moves up to the right.
* If 0 < b < 1, the graph moves down to the right

1) Identify h

2) Change into exponential form, solve for x

3) Make a t-chart by plugging in for y, and solving for x (or using calculator)

*Examples:*

*Graph the function. State the domain and range.*

y = log1/3x – 1

y = log5(x + 2)

y = log2 (x + 1) – 3

y = log1/2(x – 2) + 1

**Hmwk: page 456 #1-31, 37-43 (odd), 47-53 (odd), 61-71 (odd), 77-79**