**Algebra2 Test Study Notes**

**Unit 7 – Exponential and Logarithmic Functions**

Exponential Relations

* Functions of the form y = abx
* “a” in the equation is the initial condition (i.e. when x is zero)
* If b>0 it is a growth equation, and grows forever
* If b<0 it is a decay equation, and approaches the horizontal asymptote of zero
* Create an equation from two points, by dividing the equations
* Growth Equations
	+ $y=a(1+r)^{t}$
	+ $y=ae^{kt}$
* Decay Equations
	+ $y=a(1-r)^{t}$
	+ $y=ae^{-kt}$
* r = rate in percent per time period, t = time periods, a = initial quantity
* k = constant, t = time

Inverse Relations and Functions

* Inverse functions, applied to the original function output the original input
* Undo the operations in the original function to create an inverse function
* Change “x” and “y” variables, and solve for the new “y” to find the inverse function
* Inverse function graphs are reflected over the line y=x

Logarithms and Logarithmic Functions

* Related equations y = bx and logby = x
* Log10x is the inverse function of 10x
* Many simple problems can be solved by mental math, knowing powers of numbers
* The logarithm graph is the inverse of the exponential graph
	+ Vertical asymptote at zero, through (1,0) and growing unbounded

Logarithm Properties

* Product property: logbMN = logbM + logbN
* Quotient property: logb(M/N) = logbM - logbN
* Power property: logbMx = x logbM
* Inverse properties: 
* log10 x is the common logarithm log x
* Change of base formula $log\_{a}n= \frac{log\_{b}n}{log\_{b}a}$ this works for any base, including e

Exponential and Logarithmic equations

* Use log properties to combine terms into one term,
	+ Then inverse with functions
	+ Or equate the inputs to the log functions
* Use logarithms to inverse exponential expressions
* Logs of numbers can be found with a scientific calculator
* Continuously compounded interest is calculated with A = Pert
	+ A is the interest
	+ P is the principal
	+ r is the annual interest rate
	+ t is the time period

Base e and Natural Logarithm

* A logarithm in base e is referred to as a natural logarithm, and written ln(x)
* ex and ln(x) are inverse functions

Scientific calculators are required, graphing calculators may be used