Pre Calculus **2009 Summer Assignment**

The following is a topical review of concepts that were taught in your Algebra II class. In order to prepare you for Calculus, you should have an understanding of these topics. During the first 4 weeks of precalculus, we will cover these topics in more detail. After that we will begin with Trigonometry and then continue with the rest of the course. Read through each section of topics and answer the review questions. YOU MUST SHOW ALL WORK the answer sheet provided!! If you use a calculator, describe the steps you used to obtain your answer. Circle all answers. This is due the first day of school

Functions and Their Graphs

- Slope formula
- Slope concepts (positive/negative/horizontal/vertical; parallel/perpendicular)
- Forms of Linear Equations (Point-Slope, Slope-Intercept, Standard)
- Finding Equations of lines given conditions (points, intercepts, slopes, perpendicular, parallel)
- Parent Function graphs (Constant, Linear, Quadratic, Cubic, Square Root, , Rational, Exponential, Logarithmic, Absolute Value, Step)
- Characteristics of Functions
    - Domain
    - Range
    - Increasing/Decreasing intervals (**only** the *x*-values)
    - Concavity
    - Symmetry {*x*-axis, *y*-axis, $y = x$, origin}
    - Continuity
    - Asymptotes
- Finding Domain of function (rational and radical functions)
- VLT test for function
- Transformations of Functions $\left(A \cdot f(B(x-C)) + D\right)$ – Vertical dilation, Horizontal dilation, Horizontal shift, Vertical shift, Reflection over *x*-axis, Reflection over *y*-axis, Absolute Value (partial reflection over *x*-axis)
- Composition of Functions – substituting one function into another
- One-to-One functions (HLT and **algebraic test**)
- Inverse Functions – functions that "undo" each other, reflections over the line $y = x$, prove functions are inverse by means of composition
- Linear Regression

Polynomial and Rational Functions

- Forms of Quadratic Functions (standard, vertex, intercept)
- Graphing Quadratic functions (parabolas)
- Finding vertex algebraically (completing the square process, formulas)
- Graphing polynomial functions
    - Long-run behavior (degree and sign)
    - Short-run behavior (multiplicity of roots; inflections points; max/min points)
- Getting the polynomial equation from a graph (looking at roots, multiplicity, and end-behavior)
- Finding roots (real zeroes) by factoring (synthetic division needed when degree is 3+)
- Synthetic division
- The Imaginary Number, *i*
    - Add, subtract, multiply (remember $i^2 = -1$)
    - Simplifying a quotient of complex numbers (multiply by $\frac{conjugate}{conjugate}$ and simplify)
- Complex number conjugates
- Fundamental Theorem of Algebra (degree = # of roots; pairs of irrational and complex roots)
- Definition of Rational functions
- Domain of Rational functions

- Graphing rational functions
  - *x*- and *y*-intercepts
  - vertical and horizontal asymptotes
  - slant (oblique) asymptotes (only top-heavy by 1; use long division to find equation)
  - "holes" in the graph (common factor in numerator and denominator)
  - effect of "squared factor" in the denominator (same direction along the VA)
- Getting the equation from a graph

Chapter 3 – Exponential and Logarithmic Functions

- Exponent Properties (when to add/subtract/multiply exponents; fractional exponents = radicals)
- Graphs of Exponential Growth and Decay functions $(a > 1 \ \ or \ \ a < 1)$
- Transformations of Exponential functions (same as always)
- Definition of a Logarithm
- Converting between Exponential and Logarithmic forms
- Graphs of Logarithmic functions
- Domain of Logarithmic functions
- Transformations of Logarithmic functions (same as always!)
- Properties of Logarithms
  - Special properties involving 0 and 1
  - Inverse properties ("common bases" cancel out)
  - When to multiply/divide arguments
  - Powers become coefficients
  - One-to-One properties
- Change of Base formula
- Solving exponential/logarithmic equations