**PreCalculus – Study Notes**

**Unit 2 Polynomials and Rationals**

 Quadratic Functions

* Graphing Quadratics
	+ Use transformations, and x, y intercepts
* Find minimums and maximums, f(x) when, $x=-\frac{b}{2a}$

Higher Degree Polynomials

* Sketch graphs based on:
	+ Leading coefficient, and highest power
	+ This determines characteristics in end regions
* Zeros can be found by factoring
* Intermediate Value Theorem – Every y value between two other y values exists
* Calculators can find zeros exactly

Real Zeros

* Integer zeros are limited to possible factors of the last coefficient divided by the factors of the first coefficient
* Use division of polynomials to determine which if any factors are actually zeros
* Positive real zeros is ≤ number of sign changes in polynomial (even integer)
* Negative real zeros is ≤ number of sign changes in f(-x) (even integer)

Complex Numbers

* All real numbers are complex numbers
* Addition, subtraction, and multiplication of complex numbers
* Utilize multiplication of conjugates to “clear” a denominator

Fundamental Theorem of Algebra

* Number of factors of a polynomial equals the power of the polynomial
* Complex roots of polynomials come in conjugate pairs

Rational Functions and Asymptotes

* Rational functions are polynomials written as a fraction
* Roots of the denominator of the fraction are vertical asymptotes
* Horizontal asymptotes are found by utilizing the highest degrees of the terms
	+ If Numerator and denominator are same degree, then the horizontal asymptote is the coefficients of the leading terms
	+ If the Numerators has a higher degree, the horizontal asymptote is zero
	+ If the denominator has the higher degree, there is no horizontal asymptote

Graphs of Rationals

* Simplify through factoring as best as possible
* Plot any intercepts
* Factors of the numerator are zeros
* Factors of the denominator are vertical asymptotes
* Find horizontal asymptotes by utilizing the highest powers and coefficients
* Determine the behavior between asymptotes by testing points
* Sketch with a smooth line
* Slant asymptotes found by division when numerator is one higher power than denominator

This is a ten question (100 point) test. Half the test is without a graphing calculator. See the review problems for clarification on problem types with and without a calculator.