MATH 1900 PRECALCULUS

4 Credits
Offered in Lab or Lecture Format
Prerequisite required (MATH 1200 *and* MATH1210 with a grade of C or better or Appropriate Placement-Test Score)

Revised 11/1/2004

SYLLABUS

I. **FUNCTIONS (including trigonometric functions)**
- A. Review of Cartesian coordinate system
- B. Review of relations and functions:
  1. Domain
  2. Range
  3. Even functions
  4. Odd functions
  5. Functions increasing/decreasing over intervals
- C. Review of graphs of functions
  1. Reflections about x-axis
  2. Vertical translations
  3. Horizontal translations
- D. Algebra of functions
  1. Addition/subtraction
  2. Multiplication/division
  3. Composition
- E. One-to-one functions
- F. Inverse functions
  1. Definition
  2. Finding inverses
  3. Graphing inverses
  4. Inverse trigonometric functions (Review)

II. **POLYNOMIAL and RATIONAL FUNCTIONS**
- A. Definition of a polynomial
- B. Solution of quadratic equations
  1. Review of factoring
  2. Method of completing the square
  3. Review of the quadratic formula
- C. Solution of quadratic inequalities
- D. Solution of polynomial inequalities in which the polynomials are in factored form
  1. Solutions expressed in set notation
  2. Solutions expressed in interval notation
- E. Solution of polynomial equations of degree greater than 2
  1. Synthetic division
  2. Remainder theorem
  3. Factor theorem
  4. Rational zeros
  5. Descartes' rule of signs
- G. Rational Functions
  1. Domains
  2. Zeros (odd/even)
  3. Y-intercepts
  4. Removable singularities
  5. Asymptotes

a. Vertical (odd/even)
b. Horizontal
c. Oblique

6. Graphs

*7. Introduction to the concept of limits

III. **EXPONENTIAL AND LOGARITHMIC FUNCTIONS**

A. Definition and sketch of exponential functions (including base e)
B. Definition and sketch of logarithmic functions (including base e)
C. Review of conversions between logarithmic and exponential forms
D. Review of basic properties of logarithms
E. Logarithmic equations

IV. **LINEAR ALGEBRA**

A. Solutions to systems of equations (Review)
   1. Linear systems
      a. Elimination by addition
      b. Substitution
   2. Nonlinear systems: Substitution
B. Matrices
   1. Row and column vectors
   2. 2 x 2 and 3 x 3 matrices
   3. Matrix operations
   4. Matrix inverses
   5. Use of inverse matrices to solve linear systems
C. Determinants
   1. 2 x 2 determinants
      a. Evaluation
      b. Cramer's Rule
   2. 3 x 3 determinants
      a. Evaluation
         *i) By diagonals
         ii) By minors
      b. Cramer's Rule
*D. Vectors
   1. Scalar (dot) product
   2. Vector (cross) product

V. **POLAR COORDINATES**

A. Conversions to/from rectangular coordinates
B. Graphs in polar coordinates

VI. **COMPLEX NUMBERS**

A. Square roots of negative numbers
B. Powers of i
C. Rectangular form of a complex number
D. Operations in rectangular form
   1. Addition and subtraction
   2. Multiplication and division
      a) Monomial by monomial
      b) Monomial by binomial
      c) Binomial by binomial
      d) Product of a number and its conjugate
E. The complex number plane and vector interpretation

F. Trigonometric and polar forms of a complex number
   1. Changing to and from rectangular form
   2. Operations in trigonometric and polar forms
      a) Multiplication
      b) Division

G. DeMoivre's Theorem: finding complex roots

VII. **ANALYTIC GEOMETRY**

A. Circle: standard and general equation
   1. Center, radius
   2. Graph
   3. Determination of the equation from given information

B. Parabola: standard and general equation
   1. Focus, vertex
   2. Graph
   3. Determination of the equation from given information

C Ellipse: standard and general equation
   1. Foci, vertices
   2. Graph
   3. Determination of the equation from given information

D. Hyperbola: standard and general equation
   1. Foci, vertices, asymptotes
   2. Graph
   3. Determination of the equation from given information

*VIII. **BINOMIAL THEOREM**

*Optional topics

Note: As time permits the use of graphing calculators should be demonstrated, but in no way should it replace the teaching and testing of graphing by mathematical analysis.