NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 163 – PRECALCULUS I (3 CR.)

Course Description

Presents college algebra, matrices, and algebraic, exponential, and logarithmic functions. Lecture 3 hours per week. (Credit cannot be awarded for both MTH 163 and MTH 166). Lecture 3 hours per week.

General Course Purpose

The general purpose of this one-semester course is to prepare students for a course in applied or business-oriented calculus sequence by providing them with the necessary competencies in algebra, functions (including polynomial, rational, exponential, and logarithmic), and matrices, as well as competence in using a graphing utility. At NVCC, this course will prepare the student for the applied calculus sequence, MTH 271-272, “Applied Calculus I-II”. MTH 163 can also be used in conjunction with MATH 164, “Precalculus II” in preparation for a course in calculus with analytic geometry. At NVCC, MTH 163-164 prepares students for MTH 173-174, “Calculus with Analytic Geometry I-II.”

Course Prerequisites/Corequisites

Prerequisites: Competency in Math Essentials Units MTE 1-9 as demonstrated through the placement and diagnostics tests, or completion through unit 9 in an MTT course.

Course Objectives

As a result of the learning experience in this course, the student should be able to:

- Solve problems involving equations, inequalities, and systems of equations
- Operate on functions (addition, multiplication, composition, and inverses)
- Graph linear, quadratic, rational, exponential, and logarithmic functions
- Factor polynomials and find zeros of polynomials
- Use matrices to solve systems of linear equations
- Use a graphing utility as an aid to problem solving

Major Topics to be Included

Optional Review of Algebra
- Polynomials
- Factoring
- Rational Expressions
- Rules of Exponents for positive integer exponents
- Solution of linear equations
- Quadratic Formula and Quadratic-type equations
- Use of theorem: Solutions of p=q are a subset of the solutions of p²=q²

Required Topics

A. Exponents and radicals
   1. Definitions
      a. the zero exponent
      b. negative integer exponents
      c. rational exponents
   2. Rules for rational exponents
      a. simplifying radicals
      b. rationalizing numerator and denominator
B. Inequalities and Absolute Value
   1. Inequalities
a. definition
b. interval notation
c. graphing on the number line
d. solution of linear, quadratic, and rational inequalities

2. Absolute Value
   a. definition
   b. solution of equations and inequalities containing absolute values

C. Complex Numbers
   1. Definition
   2. Arithmetic operations

D. Linear equations in two variables
   1. Slope
   2. Intercepts
   3. Parallel and perpendicular lines
   4. Graphs
   5. Equation of a line

E. Functions
   1. Definitions, including domain and range
   2. Operations
      a. arithmetic
      b. composition
   3. Inverses with respect to composition
   4. Difference quotient
   5. Average rate of change of nonlinear functions

F. Polynomial Functions
   1. Definition
   2. Graphs, including transformations and symmetry
   3. Remainder Theorem and Factor Theorem
   4. Division of Polynomials
   5. Fundamental Theorem of Algebra
   6. Finding zeros of polynomial functions with integral coefficients

G. Rational Functions
   1. Definitions
   2. Graphs (including asymptotes)

H. Exponential and Logarithmic Functions
   1. Definitions
   2. Graphs
   3. Finding common and natural logarithms and antilogarithms
   4. Solution of equations involving exponentials and/or logarithms
   5. Growth and Decay Problems and other applications

I. Matrices
   1. Definition
   2. Multiplicative Inverse
   3. Add, subtract, scalar multiplication, matrix multiplication

J. Solving systems of linear equations
   1. Algebraically or graphically
   2. Using one or more matrix methods below
      a. Cramer's Rule
      b. Row reduction of augmented matrices
      c. Using the multiplicative inverse

Extra Topics (Optional)
A. Sequences and series
   1. \(\Sigma\) (sigma) notation
   2. Arithmetic
   3. Geometric

B. Determinant of a matrix

C. Regression using a graphing utility