

**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 $p^2=q^2$

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. Σ (sigma) notation
 - 2. Arithmetic
 - 3. Geometric
- B. Determinant of a matrix
- C. Regression using a graphing utility