

**NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 173 - CALCULUS WITH ANALYTIC GEOMETRY I (5 CR.)**

Course Description

Presents analytic geometry and the calculus of algebraic and transcendental functions including the study of limits, derivatives, differentials, and an introduction to integration along with their applications. Designed for mathematical, physical and engineering science programs. Lecture 5 hours per week.

General Course Purpose

This course is primarily for the student in mathematics, engineering, sciences, and in other areas requiring strong mathematical backgrounds. The general purpose is to give the student a basic understanding of the concepts of differential and integral calculus and to prepare the student for the second semester of calculus.

Course Prerequisite/Corequisites

Prerequisites: MTH 166, MTH 164 or two units of algebra, one of geometry, one-half unit each of trigonometry and precalculus. Credit will not be awarded for both MTH 173 and MTH 271

Course Objectives

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

- Define a function, the limit of a function at a point, continuity at a point and differentiability at a point
- State and show uses of the mean value theorem
- Computes the derivatives of polynomials, rational functions, and composite algebraic functions, and trigonometric functions, natural logarithmic and exponential functions
- Differentiate implicitly
- Apply the techniques of differential calculus to the problem of curve sketching
- Apply differentiating techniques to find velocity and acceleration and to solve related rate and maximum/minimum problems
- Defines the anti-derivative of a function and defines the Riemann integral
- Interpret the relationship between antidifferentiation and differentiation
- State and apply the fundamental theorem of calculus
- State the important properties of the integral
- Solve problems involving antiderivatives and areas
- State and use the mean value theorem for integrals
- Use approximation techniques in computing the definite integral
- Obtain competency in the use of a graphing utility and CAS in the topics below obtain a balanced understanding of all of the above concepts graphically, numerically, and symbolically

Major Topics To Be Included

- A. Optional Review of Precalculus Introductory Topics
1. Mathematical Induction
 2. Completeness Axiom
 3. Inequalities
 4. Linear Equations
 5. Absolute Values
 6. Circles and Parabolas
 7. Functions
 - a. Definition
 - b. Domain and Range
 - c. Operations (sum, difference, product, quotient, composition, and the concept of an inverse function)
 - d. Examples and classifications of important functions such as polynomials, rational function, composite algebraic functions, trigonometric functions, natural logarithmic and exponential

functions.

- B. Limits of Functions
 - 1. Definition
 - 2. Properties of Limits
 - 3. One Sided limits
- C. Continuity
 - 1. Definition
 - 2. Theorems of Continuity
 - 3. Types of Discontinuity
- D. Derivatives
 - 1. Slope of tangent lines, instantaneous rates of change and instantaneous velocity.
 - 2. Definition of derivative at a point.
 - 3. Computation of derivative using definition and rules for differentiating sums, differences, products, quotients and compositions of functions, including polynomials, rational functions, composite algebraic functions, and trigonometric functions, natural logarithmic and exponential functions.
 - 4. Relationship between continuity and differentiability
 - 5. Higher order derivatives
 - 6. Implicit Differentiation
 - 7. Mean Value Theorem
- E. Differentials
 - 1. Definition
 - 2. Linear approximations
- F. Applications of Differentiation
 - 1. Related rate problems
 - 2. Increasing and decreasing functions
 - 3. Velocity and acceleration
 - 4. Extrema: first and second derivative tests
 - 5. Maximum/minimum problems
 - 6. Concavity and points of inflection
 - 7. Asymptotes
 - 8. Curve sketching
- G. Anti-differentiation
 - 1. Definition
 - 2. Find anti-derivatives of polynomials, some trigonometric functions, and certain exponential functions
 - 3. Substitution
- H. Riemann Integral
 - 1. Definition
 - 2. Properties
 - 3. Mean Value Theorem for Integrals
 - 4. Fundamental Theorem of Calculus
- I. Application of Integrals
 - 1. Area
 - 2. Numerical Integration
 - a. Trapezoidal Method
 - b. Simpson's Rule

Extra Topics (optional)

- A. Newton's Method for approximating roots.
- B. Applications to economics (marginal cost, revenue, price and profit).
- C. Derivative of inverse functions.