

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY MTH 263 – CALCULUS I (4 CR.)

Course Description

Presents concepts of limits, derivatives, differentiation of various types of functions and use of differentiation rules, application of differentiation, antiderivatives, integrals and applications of integration. Lecture 4 hours. Total 4 hours per week. **This is a Passport Transfer Course.**

General Course Purpose

The general purpose of this first course in a three course sequence is to prepare students for further study in calculus with analytic geometry by providing them with the necessary competencies in finding limits, differentiation and integration.

Course Prerequisites/Corequisites

Prerequisite: Completion of MTH 167 or MTH 161/162 or equivalent with a grade of C or better.

Course Objectives

- Limits
 - Differentiate between the limit and the value of a function at a point
 - Find the limit of a function by numerical, graphical and analytic methods
 - Apply Limit Laws
 - Calculate one-sided limit of a function
 - Prove the existence of a limit using precise definition of the limit
 - Determine the continuity of a function
 - Calculate Vertical and Horizontal asymptotes using limits
- Derivatives and Differentiation Rules
 - Define Derivatives and Rates of Change
 - Compute derivatives of basic functions using the definition of the derivative
 - Differentiate polynomial, rational, radical, exponential and logarithmic functions
 - Find equation of a tangent line using derivative
 - Differentiate trigonometric functions
 - Apply product, quotient, chain rules
 - Apply implicit differentiation and find derivatives of inverse trigonometric functions
 - Apply concept of rates of change to natural and social sciences
 - Apply the concept of related rates
 - Define hyperbolic functions and their derivatives
 - Find linear approximation of a function at a given point
- Applications of Differentiation
 - Calculate local and absolute maximum and minimum values of a function
 - Apply Rolle's Theorem and Mean Value Theorem to study properties of a function
 - Find critical points, and intervals of increasing and decreasing values of a function
 - Find points of inflection and intervals of different concavities
 - Sketch a curve for a given function
 - Apply rules of differentiation to solve optimization problems
 - Find antiderivatives for basic functions using knowledge of derivatives
- Integrals
 - Relate areas to definite integrals using sigma notation, Riemann Sums, and limits. [Note: L'Hopital's Rule is in Calc II but may be used for instructional purposes here.]
 - Apply Fundamental Theorem of Calculus to find definite integrals and derivatives
 - Find indefinite integrals of polynomials and basic trigonometric and exponential function
 - Apply Net Change Theorem

- Perform integration using substitution
- Find areas between curves
- Find average value of a function

Major Topics to be Included

- a) Limits
- b) Derivatives and Differentiation Rules
- c) Applications of Differentiation
- d) Integrals