

CALCULUS I

Math 1950

Page 1 of 2

1.0 Course Description

- 1.1 **Overview of content and purpose:** (5 hours) Study of functions: limits; derivatives and applications; integrals, including trigonometric, exponential, and logarithmic functions.
- 1.2 **Prerequisites:** Four years of high school mathematics, including trigonometry or equivalent and satisfactory score on the Mathematics Placement Exam within the past two years, or MATH 1320 and MATH 1330, or MATH 1340, with a grade of “C” or better within the past two years, or acceptable ACT score.
- 1.3 **Unusual Circumstances:** None

2.0 Objectives

- 2.1 **Performance Objectives for the Student:** The first semester of three-semester sequence of calculus. First semester emphasizes limits, differential calculus, and an introduction to integration, with some applications.

3.0 Content and Organization

- 3.1 **Topics:**
- 1) Review of functions, including inverse functions, exponential and logarithmic functions.
 - 2) Limits and continuity.
 - a. Intuitive and ϵ - δ definition of limits.
 - 3) Derivatives
 - a. Rate of change
 - b. Slope of a curve
 - c. The derivative of a function
 - d. Formulas for differentiation
 - e. Differentiation of trigonometric functions
 - f. Chain rule
 - g. Implicit differentiation
 - h. Derivatives of the inverse trigonometric functions

CALCULUS I

- i. Derivatives of the exponential and logarithmic functions
- 4) Applications of the derivative
 - a. Mean value theorem
 - b. Rectilinear motion
 - c. Maxima and Minima of functions
 - d. Applications to graphing, first and second derivative tests.
 - e. Applications involving maxima and minima
 - f. Related rates
 - g. Differentials
 - h. Newton's Method
- 5) The integral
 - a. Indefinite integral
 - b. Integration by substitution
 - c. Area
 - d. Definite Integral
 - e. Fundamental Theorem of Calculus
 - f. Area between curves
 - g. Numerical Integration (optional)

4.0 Teaching Methodology

- 4.1 **Methods to be used:** Traditional lecture-discussion method in sections not exceeding 50 students.

5.0 Evaluation

- 5.1 **Basis for evaluating student performance:** Usually 4-5 tests and comprehensive final exam. Homework and projects may be included in the evaluation.

6.0 Resource Material

- 6.1 **Textbook(s) or other required readings:** University Calculus Elements with Early Transcendentals by Hass, Weir and Thomas, Pearson, 2009.
*NOTICE - 1950 will cover chapter 1-5, omitting 1.6.

GUIDELINES FOR CALCULUS I

Introduction

Calculus I is traditionally the first university-level mathematics course taken by students in wide variety of disciplines. For some students it is the only exposure they receive to the important mathematical concepts of the derivative and the integral. For others who will take additional mathematics, Calculus I provides the essential foundation for advanced mathematics. For most, it offers the first glimpse of the real power and excitement of mathematics. For these reasons it is one of the most important courses offered by a mathematics department. Therefore, it is important that there be consistency in the manner in which the course is offered and in the level of skill required to complete the course satisfactorily.

The major objectives of Calculus I

1. to provide an introduction to the basic concepts and methods of the differential and integral calculus;
2. to provide adequate opportunity to practice the application of the skills required to differentiate and integrate the elementary functions;
3. to provide hands-on practice in the analysis and graphing of the elementary functions;
4. to provide instruction in the translation of real problems into mathematical form for solution; and
5. to provide an introduction and exposure to the basic tools of mathematical reasoning: definition, logic, and proof.

In order to achieve the above objectives, instruction in Calculus I should include...

- a. an instructional mode designed to teach the material specified in the syllabus and to assist students in learning the material as well as possible.
- b. the frequent assignment of practice exercises and the monitoring of students' progress either by assigning, collecting, and grading homework or by regularly including in-class quizzes based on the exercises.
- c. an introduction to the logical basis of the calculus based on the definitions of the limit, continuity, and the derivative as well as the content of important theorems such as Mean Value Theorem and the Fundamental Theorem of Calculus;
- d. assignments and examinations, which require the student to work through some problems without the assistance of electronic technology such as calculators and computers.