

## MA 125 CALCULUS I

**Course Description.** This is the first of three courses in the basic calculus sequence taken primarily by students in science, engineering and mathematics. Topics include the limit of a function; the derivative of algebraic, trigonometric, exponential, and logarithmic functions; and the definite integral and its basic applications to area problems. Applications of the derivatives are covered in detail, including approximations of error using differentials, maximum and minimum problems, and curve sketching using calculus.

**Credit Hours.** 4

### Course Objectives:

*The student shall demonstrate knowledge of:*

1. Various problem-solving strategies including, but not limited to, reading the problem, interpreting the problem, selecting an appropriate mathematical model, solving the problem and reflecting on the reasonableness of the answer.
2. Resources available to enhance personal knowledge of mathematics.

*The student shall demonstrate ability to:*

3. Use estimation and approximation skills, and assess the reasonableness of solutions to problems.
4. Explain the role, nature and limitation of current and emerging technology.
5. Use current technology in problem solving and in exploring mathematical concepts.
6. Present and interpret data in graphical form.
7. Select or create appropriate mathematical models to solve problems in mathematics and in other disciplines.

### Course Content:

#### I. Functions

1. Functions and the Analysis of Graphical Information
2. Properties of Functions
3. Graphing Functions on Calculators and Computers; Computer Algebra Systems
4. New Functions from Old

5. Mathematical Models; Linear Models
  6. Families of Functions
  7. Mathematical Models
  8. Parametric Equations
- II. Limits and Continuity**
1. Limits (An Intuitive Introduction)
  2. Limits (Computation Techniques)
  3. Limits (Discussed More Rigorously)
  4. Continuity
  5. Limits and Continuity of Trigonometric Functions
- III. The Derivative**
1. Tangent Lines and Rates of Change
  2. The Derivative
  3. Techniques of Differentiation
  4. Derivatives of Trigonometric Functions
  5. The Chain Rule
  6. Implicit Differentiation
  7. Related Rates
  8. Local Linear Approximation; Differentials
- IV. Analysis of Functions and Their Graphs**
1. Analysis of Functions I: Increase, Decrease, and Concavity
  2. Analysis of Function II: Relative Extrema; First and Second Derivatives Tests
  3. Analysis of Function III: Applying Technology and the Tools of Calculus
  4. Rectilinear Motion (Motion Along a Line)
  5. Absolute Maxima and Minima
  6. Applied Maximum and Minimum Problems
  7. Newton's Method
  8. Rolle's Theorem, Mean-Value Theorem
- V. Integration**
1. An Overview of the Area Problem
  2. The Indefinite Integral; Integral Curve and Direction Fields
  3. Integration of Substitution
  4. Sigma Notation
  5. The Definite Integral
  6. The fundamental Theorem of Calculus
  7. Rectilinear Motion Revisited; Average Value
  8. Evaluating Definite Integrals by Substitution
- VI. Applications of the Definite Integrals**
1. Area Between Two Curves
  2. Volumes by Slicing; Disks and Washers
  3. Volumes by Cylindrical Shells
  4. Length of a Plane Curve
  5. Area of a Surface of Revolution

**Course Requirement:** Regular attendance. Each student must have a TI-85 or TI-86 Graphing Calculator.

**Course Evaluation:** Tests and quizzes will be given for the purpose of evaluation.

**ACCOMMODATION STATEMENT:**

In accordance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973, the University offers reasonable accommodations to students with eligible documented learning, physical and/or psychological disabilities. Under Title II of the Americans with Disabilities Act (ADA) of 1990 and Section 504 of the Rehabilitation Act of 1973, a disability is defined as a physical or mental impairment that substantially limits one or more major life activities as compared to an average person in the population. It is the responsibility of the student to contact *Developmental Services* prior to the beginning of the semester to initiate the accommodation process and to notify instructors within the first three class meetings to develop an accommodation plan. Appropriate, reasonable accommodations will be made to allow each student to meet course requirements, but no fundamental or substantial alteration of academic standards will be made. Students needing assistance should contact *Developmental Services*.

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**UNIVERSITY OF NORTH ALABAMA**