

# MATH 1910 CALCULUS I

4 Credits

Offered in Lecture Format

Prerequisite required (MATH 1900 with a grade of C or better or  
Appropriate Placement-Test Score)

## SYLLABUS

### I. PRELIMINARY TOPICS

- A. Functions
- B. Classification of functions
- C. Operations on functions
- D. Composition of functions
- E. Inverse functions
- F. Trigonometric functions

### II. THE LIMIT CONCEPT

(It is left to the instructor to choose between the epsilon-delta approach and the more intuitive approach.)

- A. The definition of a limit at a point
- B. Properties of limits
  - 1. The squeezing theorem
  - 2. Trigonometric limits
- C. One-sided limits
- D. Limits involving infinity and asymptotes
- E. Continuity
  - 1. Continuity at a point
  - 2. Continuity on an interval
  - 3. The intermediate value theorem

### III. THE DERIVATIVE

- A. Slopes of tangents and instantaneous rates
- B. Defining the derivatives
  - 1. Terminology
  - 2. Notation
  - 3. Finding derivatives
  - 4. Functions which are not differentiable
- C. Derivatives of polynomials
- D. Product and quotient rules
- E. Higher order derivatives
- F. Derivatives of sine and cosine
- G. The chain rule
  - 1. Functions involving integer powers
  - 2. Functions involving sine and cosine
- H. Implicit differentiation
- I. The power rule for rational powers

#### IV. APPLICATIONS OF THE DERIVATIVE

- A. Linear approximation; differentials
- \*B. Newton's method for  $f(x) = 0$
- C. The mean value theorem
- D. Curve sketching
  - 1. Maxima and minima
  - 2. Increasing and decreasing functions
  - 3. The first derivative test
  - 4. Concavity
  - 5. The second derivative test
  - 6. Intercepts, asymptotes and symmetry
  - 7. Generating complete sketches using topics 1 through 6
- E. Related rate problems

#### V. INTRODUCTION TO INTEGRATION

- A. Antiderivatives
  - 1. The indefinite integral
  - 2. Basic formulas
- B. Summation notation
- C. Areas as limits of sums
- D. The definition of the definite integral
  - 1. Terminology
  - 2. Notation
  - 3. Properties
- E. The fundamental theorem of calculus
- F. Integration by substitution
  - 1. The power rule
  - 2. The general sine and cosine formulas

#### VI. SOME APPLICATIONS OF INTEGRATION

- A. Area
- B. Volume
  - 1. Washer method
  - 2. Shell method
  - \*3. By slicing
- \*C. Arclength
- \*D. Work
- \*E. Liquid pressure and force
- \*F. Centers of mass; centroids

\*Optional