

HERKIMER COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Mathematics/Science/Allied Health and Physical Education
COURSE TITLE: Calculus I
COURSE NUMBER: MA 245
CREDIT: 4 Credits (4,0)
DATE: Revised Fall 2006
GRADE TYPE: Letter Grade
PREPARED/REVIEWED BY: M. Oriolo

COURSE DESCRIPTION

An introduction to calculus, including functions, limits, continuity, differentiability, the derivative, the derivatives of simple functions and trigonometric functions, and the application of the derivative and antidifferentiation.
Prerequisites: MA 141 Pre-Calculus Mathematics or high school equivalent.

COURSE OBJECTIVES

After completing this one semester first course of sequential exposition of pre-existing calculus and analytic geometry, the student will be able to:

1. Exercise basic principles of real numbers related to order, inequalities, absolute value and intervals.
2. Determine the location and shape of selected conic sections in the plane.
3. Draw a quick sketch of basic polynomial, rational, radical, and trigonometric functions.
4. Recognize the definition of a limit and interpret it graphically.
5. Apply limit theorems to find the limit values of specific functions.
6. Apply the definition of continuity to locate points of areas of discontinuity of specific functions.
7. Recognize the definition of the derivative of a function as a limit.
8. Apply derivative procedures to find the derivative of various classes of functions: polynomial, rational, trigonometric, radical, and composites of these.
9. Differentiate functions implicitly where appropriate or necessary.
10. Apply the derivative to problems in continuity, curve sketching, rates of change, related rates problems, etc.
11. Use the first and second derivative tests to locate where functions are increasing or decreasing and where functions have relative maximum or minimum points.
12. Recognize the definition of a differential as a function of two variables: $dy = f(x)dx$.
13. Find differentials of various functions.
14. Interpret Rolle's Theorem graphically.
15. Interpret the Mean Value Theorem graphically.
16. Use max/min theory to solve optimization problems.
17. Use the graphing calculator/computer to plot graphs, calculate limits, and apply calculus concepts to graphs.
18. Use the graphing calculator/computer to estimate the area under a curve including the Trapezoidal and Simpson's Rule.
19. Understand the concept of a definite integral as a limit sum.
20. Recognize basic properties of the definite integral.
21. Evaluate definite integrals via the Fundamental Theorem of Calculus.
22. Evaluate definite integrals using the single substitution method.

OUTCOMES

By the end of this course, students will demonstrate 60% mastery on average on all tests administered.

MAJOR DIVISIONS OF SUBJECT MATTER

- I. Introduction to Calculus
- II. Limits and Their Properties
 - A. Definition of Limit
 - B. Evaluation of Limits Using Limit Properties
 - C. Continuity and One-Sided Limits
 - D. Infinite Limits
- III. Differentiation
 - A. Definition of Derivative
 - B. Velocity, Acceleration, Other Rates of Change
 - C. Basic Differentiation Rules
 - D. Product and Quotient Rules
 - E. The Chain-Rule
 - F. Implicit Differentiation
 - G. Related Rate Problems
- IV. Applications of Differentiation
 - A. Extreme on an Interval
 - B. Rolle's Theorem and Mean Value Theorem
 - C. Finding Max-Min Points Using First Derivative
 - D. Finding Points of Inflection Using Second Derivative; Concavity
 - E. Curve Sketching
 - F. Max-Min Optimization Problems
 - G. Differentials
- V. Integration
 - A. Antiderivatives and Indefinite Integration
 - B. Area
 - C. Riemann Sums and the Definite Integral
 - D. The Fundamental Theorem of Calculus
 - E. Integration by Substitution

COURSE REQUIREMENTS

Please see individual instructor's syllabus.

EVALUATION/GRADING

Please see individual instructor's syllabus.

TEXTBOOK

Please see individual instructor's syllabus.

CLASSROOM POLICIES

Cell phones, food, drink, and inappropriate language are not allowed in class. Regular attendance and punctuality are expected.

Please see individual instructor's syllabus for a more detailed explanation of classroom policies.