Rochester COMMUNITY AND TECHNICAL College

# COMMON COURSE OUTLINE: Course discipline/number/title: MATH 1127: Calculus I

## A. CATALOG DESCRIPTION

**1. Credits: 5**
**2. Hours/Week: 5**
**3. Prerequisites (Course discipline/number):** 4 years of high school mathematics including trigonometric functions with a "B" average or higher and/or appropriate placement from the current placement test or Math 1117 (Pre-calculus)
**4. Co-requisites (Course discipline/number):** None
**5. MnTC Goals (if any):** CT, MA

This course s a Liberal Arts mathematics course with major topics including: limits, differentiability of functions and relations, sketching of functions, applications such as related rates, optimization, area under a curve, volumes of rotation, and inverse functions.

## B. DATE LAST REVISED (Month, year): December, 2007

## C. OUTLINE OF MAJOR CONTENT AREAS:

1. By the end of the semester the students will be able to:
2. Understand and complete inductive and deductive type proofs.
3. Reason out and solve equations and inequalities including polynomial, single and multiple absolute value, and trigonometric and apply these concepts to calculus
4. Understand the concept and existence of a limit
5. Evaluate limits at a point and at infinity with relation to asymptotic behavior
6. Relate limits to continuity and discontinuity
7. Understand various notations of derivatives
8. Use the definition of the limit of the difference quotient, derivative rules including: product rule, quotient rule, power rule, chain rule, and implicit differentiation to evaluate derivatives
9. Understand the concept of differential and apply to approximation
10. Use Newton's Method to approximate roots of a function
11. Sketch functions and relations using concepts from algebra as well as continuity, asymptotic and end behavior, increasing/decreasing, extrema, concavity, and inflections
12. Set up and solve related rate problems
13. Set up and solve optimization problems
14. Understand the concepts of definite and indefinite integrals
15. Know exact integrals and substitution to evaluate other integrals
16. Set up and evaluate areas using Riemann sums and definite integrals
17. Set up and evaluate applied problems such as volumes of rotation by disks, washers, and shells and volumes by cross sections, work problems involving spring motion or fluid motion
18. Know average value of a function
19. Understand exponential and logarithmic functions with applications to growth and decay problems
20. Understand inverses as applied to derivatives
21. Apply inverse techniques to trigonometric, inverse trigonometric functions,and their derivatives

## D. LEARNING OUTCOMES (GENERAL): The student will be able to:

1. Recognize, understand, and articulate proficiency in mathematics with respect to problem solving
2. Be able to understand and solve complex real-world problems using various approaches and reason out solutions using graphical approaches, algebraic approaches, and logical reasoning

## E. LEARNING OUTCOMES (MNTC): Competencies from the Minnesota Transfer Curriculum (MNTC):

Goal 2: Critical Thinking (CT): The student will be able to:

1. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.
2. Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives, which can give alternative meanings or solutions to given situations or problems.
3. Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.

**E. LEARNING OUTCOMES (MNTC):** Competencies from the Minnesota Transfer Curriculum (MNTC): **Continued. . .**

4. Recognize and articulate the value assumptions, which underlie and affect decisions, interpretations, analyses, and evaluations made by ourselves and others.

Goal 4: Mathematics/Symbolic Systems (MA): The student will be able to:

1. Illustrate historical and contemporary applications of mathematics/logical systems.
2. Clearly express mathematical/logical ideas in writing.
3. Explain what constitutes a valid mathematical/logical argument (proof).
4. Apply higher-order problem solving and/or modeling strategies.

**F. METHODS FOR EVALUATION OF STUDENT LEARNING:**

1. Objective and short answer tests
2. Group work

**G. SPECIAL INFORMATION (if any):**

Additional fees may be required for field trips