NORMANDALE COMMUNITY COLLEGE **2/22/2012**
COMMON COURSE OUTLINE
MATH 1510, CALCULUS 1

I. EFFECTIVE DATE OF OUTLINE

Fall Semester, 2010. To be reviewed by the department annually.

II. CATALOG DESCRIPTION

A. MATH 1510
B. Calculus 1
C. 5 credits
D. Offered Fall and Spring Semesters
E. Prerequisite: MATH 1500 with a grade of C or higher; or placement in MATH 1510.
F. Topics include functions, limits, derivatives, and an introduction to integration. Applications include – but are not limited to – science, engineering, economics, and ecology. Satisfies MnTC Goal 4.

III. RECOMMENDED ENTRY SKILLS/KNOWLEDGE

Students are expected to have mastered and retained the material covered in a standard pre-calculus program: the real number system, functions, linear and quadratic functions, higher degree polynomials, exponential and logarithmic functions, trigonometric functions, inverse trigonometric functions, systems of equations and inequalities, conic sections, parametric equations, complex numbers, and polar coordinates. Students should be able to think logically and solve problems at the pre-calculus level. Students should be competent in algebraic manipulations and should be familiar with graphing calculator technology. To do well in this course, students should have excellent work habits and be dedicated to a complete understanding of concepts and their application.

IV. OUTLINE OF MAJOR CONTENT AREAS

A. Brief review of pre-calculus/trigonometry
B. Limits and the derivative
C. Derivative formulas
D. Applications of the derivative
E. Introduction to integration
F. Constructing antiderivatives

V. LEARNING OUTCOMES

Upon successful completion of MATH 1510, students will be able to: (Letters in parentheses refer to student competencies of the Minnesota Transfer Curriculum, Goal 2–Critical Thinking, and Goal 4–Mathematical/Logical Reasoning.)

A. Demonstrate knowledge of the functions used in calculus and their basic properties. (4a,4b)
B. Learn the concept of the limit of a function graphically, numerically, and algebraically; apply limit laws; be able to use limits to define continuity and describe asymptotic behavior of functions. (2c,4c,4d)
C. Apply the limit concept to average rates of change and difference quotients to understand the derivative as a measure of change. (2b,4b,4c,4d).
D. Learn the rules and techniques of differentiation: algebraic combinations, composites, inverses, implicit functions and parametric functions. (4b,4d)
E. Understand the connections between derivatives and tangent lines, linearizations and approximations. (2a,4b,4d)
F. Determine various behaviors of functions using their first and second derivatives. (4a,4b,4d)
G. Apply derivatives to examine families of functions, to carry out extreme value searches and apply calculus in other disciplines. (2a,2c,4b,4d)
H. Make use of derivatives for special topics: L'Hospital's Rule, Related Rates, Newton's Method, and the Mean Value Theorem. (4a,4b,4c,4d)
I. Develop the definite integral concept as a limit of Riemann sums, and learn its basic interpretations. (2c,4a,4b)
J. Use antiderivatives and substitution to evaluate definite integrals and formulate the fundamental theorems of the calculus. (2a,2b,4a,4c)

VI. METHODS USED FOR EVALUATION OF STUDENT LEARNING

The instructor will choose from among various evaluation techniques including – but not limited to – in-class testing, take-home testing, assignments, quizzes, attendance, group or individual projects, and research. The instructor will also choose a method for end-of-the-semester evaluation. There will be a gateway exam on calculating derivatives without the help of tables or calculators. Passing this exam is required to pass the course.

VII. SPECIAL INFORMATION

Instructors will require some type of technology. This may include the use of one or more of a graphing calculator or computer algebra tools (such as the TI-89, MAPLE, Mathematica, or Wolfram Alpha).