

ROWAN UNIVERSITY
Department of Mathematics

Syllabus
Math 01.130 - Calculus I

CATALOG DESCRIPTION:

Math 01.130 Calculus I 4 s.h.

Prerequisites: minimum C- in Math 01122, or 60 on CLM exam, or 60 on CLM re-test, or 600 on SAT, or 27 on ACT Math.

Calculus is a subject about functions. This course deals primarily with the two most fundamental concepts in Calculus: derivatives and definite integrals. It begins with a discussion of notions of the limit and continuity of a function. Then the definition of a derivative is introduced, and techniques of computing derivatives are studied. Through applications to analysis of functions, optimizations and problems in sciences, a student can appreciate the importance of the derivative. The concept of a definite integral as a limit of approximating sums emerges naturally in the context of problems of areas. Hidden links between those two concepts are formulated in the Fundamental Theorems of Calculus, which also provide a convenient shortcut for computing definite integrals. A graphing calculator is required for this course, and so is the use of computer software, such as Mathematica. Students are expected to have completed an equivalent of (Math 01122) Pre-Calculus.

OBJECTIVES:

Students will demonstrate the ability to: (i) compute limits; (ii) differentiate and integrate polynomial, rational, algebraic, exponential, logarithmic and trigonometric functions; (iii) use differentiation to solve extreme and related rate problems, and (iv) use integration to find areas and volumes.

CONTENT:

1: Prerequisites for Calculus

A brief review of functions and their graphs.

2: Limits and Continuity

It is recommended that the emphasis here be on definitions and on intuitive understanding of concepts, though formal delta and epsilon proofs should be demonstrated.

3: Derivatives

The derivative definition and the rules for finding derivatives of polynomial, rational, exponential, logarithmic, trigonometric and algebraic, and inverse functions. Implicit differentiation, related rates.

4: Analysis of functions and their graphs

Increasing and decreasing functions, concavity, Relative extreme, First and 2nd derivative tests, Rolle's Theorem and the Mean Value Theorem.

5: Applications of Derivatives

Applications of the derivative to maxima and minima, the relationships between distance, velocity and acceleration.

6: Integration

The definite integral is formally defined and the definition is used to evaluate the integral. The Fundamental Theorem of Calculus is proved and techniques for evaluation of both definite and indefinite integrals by means of the Fundamental Theorem is discussed. The process of integration by means of a change of variable is then introduced.

7: Applications of Definite Integrals

Areas between two curves by the use of the definite integral.

REMARKS: In each chapter we will be studying a little about the history of the development of Calculus through a brief study of the biographies of the great mathematicians who developed it. In addition, we will begin to learn to use Mathematica as a tool.

TEXTBOOK(s):

Textbook used:

- Rogawski, Jon; Colin Adams, CALCULUS: EARLY TRANSCENDENTALS (3rd Edition), 2015, Freeman.

Additional textbooks:

- Stewart, James, CALCULUS: EARLY TRANSCENDENTALS (8th Edition), 2016, Cengage Learning.

(Note: There are many suitable texts available that cover the same material at the same level. Among these are those by Anton, Larson, Thomas, Stein, Hunt and Leithold).