

Mathematics 2513 – Calculus I

Student Learning Outcomes

- 1. The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course.** Students will read, interpret, and use the vocabulary, symbolism, and basic definitions used in Calculus I as they pertain to functions, limits, derivatives, and integrals.
- 2. The students will describe the fundamental principles including the laws and theorems arising from the concepts covered in this course.** Students will identify and apply the laws and formulas that result directly from the definitions; for example, domain and range of a function, operations on functions, limit laws, differentiation formulas, integration formulas and integration techniques.
- 3. The students will apply course material along with techniques and procedures covered in this course to solve problems.** Students will use the facts, formulas, and techniques learned in this course to sketch graphs of functions; to study position-velocity-acceleration problems; to solve related rate and optimization (“max-min”) problems; to analyze problems in physics; to calculate areas and volumes.
- 4. The students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.** Students will acquire a level of proficiency in the fundamental concepts and applications necessary for further study in academic areas requiring Calculus I as a prerequisite, or for work in occupational fields requiring a background in Calculus I. These fields might include computer science, engineering, the physical and natural sciences as well as mathematics.

Course Content

Textbook: *Free access to an electronic copy of a textbook by Briggs and Cochran will be provided.*

- 1. Functions:** Review of functions, representing functions, inverses of exponential, logarithm, and trigonometric functions.
- 2. Limits:** The idea of limits, definition of a limit, computing limits, infinite limits, limits at infinity, and continuity.
- 3. Derivatives:** Introducing derivatives, rules of differentiation, product and quotient rules, derivative of trig functions, derivatives as rates of change, chain rule, implicit differentiation, derivatives of exponential, logarithm, and trigonometric functions, related rates.
- 4. Applications of Differentiation:** Maxima and minima values, what the derivative tells us, graphing functions, optimization problems, linear approximations and differentials, the Mean Value Theorem, L'Hospital's Rule, antiderivatives.
- 5. Integration.** Area under a curve, definite integral, the Fundamental Theorem of Calculus, working with integrals, substitution.
- 7. Techniques of Integration:** Integration by parts, trigonometric integrals, trigonometric substitution, integration by partial fractions.
- 6. Applications of Integration:** Velocity and net change, regions between functions, volume of rotation by slicing volumes, disk method, washer method, shell method.