

Calculus

COURSE DESCRIPTION:

This course introduces limits, differentiation, and integration of functions. Students will find and evaluate finite and infinite limits graphically, numerically, and analytically. They will find derivatives using a variety of methods including The Chain Rule and Implicit Differentiation. They will use the First Derivative Test and The Second Derivative Test to analyze and sketch functions.

Subsequently, students will find antiderivatives using a variety of methods including substitution. They will evaluate integrals using a variety of methods including numerical integration. They will understand and apply Riemann sums, definite integrals, and The Fundamental Theorem of Calculus. In particular, they will differentiate and integrate logarithmic, exponential, and inverse trigonometric functions. They will solve simple differential equations that can be solved by separation of variables and use them to solve applied problems. They will use integration to determine the area between two curves, volume, and surface area. Finally, they will apply integration to determine work, center of mass, and fluid force.

The use of graphing calculator is considered an integral part of the course and students will use a graphing calculator throughout this course.

PREREQUISITES: Pre-Calculus

COURSE LENGTH: Two semesters

COURSE OUTLINE:

Semester 1

Course Overview

- Course Introduction
- Getting Started
- Research Papers

Limits and Their Properties

- Limits and Their Properties: Introduction
- Linear Models and Rates of Change
- Functions, Graphs of Functions, and Finding Models to Data
- Finding Limits Graphically, Numerically, and Analytically
- Continuity, One-Sided Limits, and Infinite Limits
- Exam Preparation

Differentiation

- Limits and Their Properties
- Linear Models and Rates of Change
- Functions, Graphs of Functions, and Finding Models to Data
- Finding Limits Graphically, Numerically, and Analytically
- Continuity, One-Sided Limits, and Infinite Limits
- Exam Preparation

Calculus (continued)

COURSE OUTLINE (continued):

Applications of Differentiation

- Applications of Differentiation: Introduction
- Extrema and The Mean Value Theorem
- Derivative Tests, Limits, and Graphs
- Optimization, Newton's Method, and Differentials
- Exam Preparation

Integration

- Integration: Introduction
- Antiderivatives and Indefinite Integration
- Area, Riemann Sums, and Definite Integrals
- The Fundamental Theorem of Calculus
- Integration by Substitution and Numerical Integration
- Exam Preparation

Logarithmic, Exponential, and other Transcendental Functions

- Logarithmic, Exponential, and other Transcendental Functions: Introduction
- The Natural Logarithmic Function
- Inverse Functions and Exponential Functions
- Inverse Trigonometric Functions
- Hyperbolic Functions
- Exam Preparation

Differential Equations

- Differential Equations: Introduction
- Slope Fields, Euler's Method, and Growth and Decay
- Separation of Variables and First Order Linear Differential Equations
- Exam Preparation

Applications of Integration

- Applications of Integration: Introduction
- Area of a Region Between Two Curves
- Volumes, Arc Lengths, and Surfaces
- Work, Moments, and Fluids
- Exam Preparation