

Calculus Part A – High School

COURSE DESCRIPTION: The Calculus course is a comprehensive look at the study of differential and integral calculus concepts including limits, derivative and integral computation, linearization, Riemann sums, the Fundamental Theorem of Calculus, and differential equations. Applications include graph analysis, linear motion, average value, area, volume, and growth and decay models.

COURSE OBJECTIVES:

- Evaluate limits, including those involving infinity.
- Define and apply numerical and function derivatives.
- Understand the relationship between continuity and differentiability.
- Differentiate a variety of functions written in explicit and implicit form.
- Analyze the behavior of a function using limits and derivatives.
- Apply differential calculus to linear approximations, motion along a line, related rate problems, and optimization.
- Define and apply antiderivatives and indefinite integrals.
- Define and apply Riemann sums and definite integrals.
- Understand the consequences of the Fundamental Theorem of Calculus.
- Integrate a variety of functions.
- Apply integral calculus to average value, total change, motion along a line, initial value problems, area, and volume.
- Model and solve problems involving differential equations.

PREREQUISITES: None

COURSE LENGTH: One Semester

REQUIRED TEXT: No required textbook for this course

MATERIALS LIST: Java is needed for the embedded graphing calculator applet (GCalc). A free download is available at <http://www.java.com/en/download/>.

COURSE OUTLINE:

Unit 1: Limits and Continuity

- Section A - Concept of a Limit

- Section B - Algebraic Computation of a Limit
- Section C - Limits Involving Infinity
- Section D - Continuity
- Section E - Intermediate Value Theorem

Unit 2: Derivatives

- Section A - Concept of a Derivative
- Section B - Differentiability
- Section C - Graphs of f and f'
- Section D - Motion along a Line
- Section E - Tangent Line Approximation

Unit 3: Differentiation

- Section A - Basic Computation Rules
- Section B - Higher Order Derivatives
- Section C - Product, Quotient, and Chain Rules
- Section D - Implicit Differentiation
- Section E - Derivatives of Inverse Functions

Unit 4: Graph Behavior

- Section A - Asymptotes and End-Behavior
- Section B - Increasing/Decreasing Behavior and Concavity
- Section C - Relative Extreme Values and Points of Inflection
- Section D - Absolute Extreme Values and Extreme Value Theorem
- Section E - Graph Analysis

Unit 5: Derivative Applications

- Section A - Mean Value and Rolle's Theorems
- Section B - Rates of Change
- Section C - Related Rates
- Section D - Optimization

Semester 1 Exam