

Course Outline: A.P. Calculus

- I. Functions, Graphs, and Limits
 - a. Analysis of Graphs with the Aid of Technology
 - b. Limits of Functions
 - c. Asymptotic and Unbounded Behavior
 - d. Continuity
 - i. In terms of Limits
 - ii. In terms of Graphs
 - e. Intermediate Value Theorem
 - f. Extreme Value Theorem

- II. Derivatives
 - a. The Concept of the Derivative
 - i. As an Instantaneous Rate of Change
 - ii. As the Limit of the Difference Quotient
 - iii. As the slope of the Tangent Line
 - b. The Derivative as a Function
 - i. Corresponding characteristics of the graphs of f and f'
 - ii. The Relationship Between Increasing and Decreasing Functions and the Sign of f
 - iii. The Mean Value Theorem
 - c. Second Derivatives
 - i. Corresponding Characteristics of the Graphs of f , f' , and f''
 - ii. Concavity
 - iii. Points of Inflection
 - d. Computation of Derivatives
 - i. Basic Functions including Power Functions, Exponential, Logarithmic, Trigonometric, and Derivatives of the Inverse of Functions, including the Inverse Trigonometric Functions
 - ii. Basic Rules for Derivatives of Sums, Products, and Quotients of Functions
 - iii. The Chain Rule
 - iv. Implicit Differentiation
 - e. Applications of Derivatives
 - i. Analysis of Curves
 - ii. Optimism
 - iii. Rates of Change including Related Rate Problems
 - iv. Velocity, Speed, Acceleration

- III. Integrals

- a. Interpretation and Numerical Approximation of the Integral
 - i. Reimann Sums, including Right, Left, and Midpoint Sums
 - ii. Limits of Reimann Sums
 - iii. The Trapezoid Rule
 - iv. Basic Properties of the Definite Integral
- b. The Fundamental Theorem of Calculus
 - i. Evaluating Definite Integrals
 - ii. Representing a Particular Antiderivative
- c. Techniques of Integration
 - i. Directly from the Derivatives of Basics Functions
 - ii. Substitution of Variables
 - iii. Integration by Parts
- d. Applications of Integrals
 - i. Area of a Region
 - ii. Volume of a Solid with Known Cross Sections
 - iii. Average Value of a Function
 - iv. Distance Traveled by a Particle Along a Line
 - v. Solving Separable Differential Equations
 - vi. Growth and Decay
 - vii. Modeling and Solving Problems in Physics, Biology, Economics, etc by Using Integration