AP Calculus AB

1st Semester Objectives

- Evaluate limits of algebraic and trigonometric functions and combinations thereof as x approaches a finite value or at infinity or determine that limits do not exist.
- Evaluate two-sided limits of algebraic and trigonometric functions and combinations thereof and determine continuity in terms of limits.
- Develop the concept of derivative as an instantaneous rate of change and determine a derivative as a limit, as a difference quotient, and from graphs and tables of data.
- Find first and higher order derivatives of elementary functions and their sums, differences, products and quotients.
- Find first and higher order derivatives of composite functions.
- Find derivatives of implicitly and piecewise defined functions.
- Use the first derivative to find increasing and decreasing intervals, determine extrema, and apply the Mean Value Theorem and its geometric consequences.
- Use the first and second derivatives to find intervals of concavity, determine points of inflection, solve rectilinear motion problems and determine extrema using the second derivative test.
- Write equations of tangent and normal lines, and use the tangent line to estimate values of functions.
- Use derivatives to solve optimization and related rate problems.
- Use antiderivatives to evaluate indefinite integrals involving algebraic and trigonometric functions (sine and cosine only), solve first-order separate differential equations and represent the general solution of a differential equation using slope field.

2nd Semester Objectives

- Find indefinite integrals following directly from derivatives of elementary functions and by substitution of variables.
- Find derivatives of exponential, logarithmic, inverse functions, inverse trig functions.
- Find derivatives of inverse trig functions and use both logarithmic differentiation and L'Hospital's Rule.
- Find indefinite integrals following directly from derivatives of logarithmic, exponential and inverse trig functions by simple integration by parts and by partial fractions.
- Apply the indefinite integral to solve separable differential equations (in particular, y'=ky and the exponential growth and decay model) and find specific antiderivatives using initial conditions, including applications of motion along a line.
- Develop the concept of the definite integral by approximations using left, midpoint, and right Riemann Sums and Trapezoidal Rule and using basic properties of definite integrals to evaluate given integrals.
- Apply the definite integral to find total distance traveled given the velocity or acceleration and to find the area of the bounded region.
- Apply the definite integral to find total distance traveled given the velocity or acceleration and find the volume of a solid of revolution.
- Apply the First Fundamental Theorem of Integral Calculus to evaluate definite integrals, find the average value of a function, find the accumulation of a function over an interval given its rate of change, and interpret the meaning of a given definite integral.
- Apply the Second Fundamental Theorem of Integral Calculus to find the derivative of a function defined as a definite integral and identify the characteristics of a function defined as a definite integral.