

**MATHEMATICS STANDARDS
(AP) Calculus (AB)**

STANDARD 1: ELEMENTARY FUNCTIONS

Standard: Students demonstrate their knowledge of algebraic, trigonometric, exponential, and logarithmic functions.

Student Performance Expectations: All students who have completed one year of Calculus shall be expected to:

- 1.1 Demonstrate how to solve absolute equations, inequalities, trigonometric, exponential and logarithmic equations.
- 1.2 Identify, state the domain and range, and sketch the graph of elementary functions.
- 1.3 Use a graphing calculator to graph and find the roots of a function.
- 1.4 Use different techniques of graphing such as shifting, moving, stretching, or shrinking.

STANDARD 2: LIMITS AND DIFFERENTIAL CALCULUS

Students demonstrate their knowledge of the limits, continuity, the derivative and problem solving using derivative concepts.

Student Performance Expectations: All students who have completed one year of Calculus shall be expected to:

- 2.1 Demonstrate the understanding of limit properties, e.g., limit of a constant, sum, product and quotient.
- 2.2 Find the high order derivatives, relation between differentiability and continuity.
- 2.3 Show different types of non existent limits.
- 2.4 Identify different cases of discontinuity and differentiate between removable and non-removable discontinuity.
- 2.5 Students demonstrate an understanding and application of the formal definition of derivative of a function at a point and the notion of differentiability.
- 2.6 Students demonstrate an understanding and application of the Intermediate Value Theorem, Extreme Value Theorem, Mean Value Theorem, and Rolle's Theorem.
- 2.7 Use Newton's method to approximate the zeros of a function.
- 2.8 Find the derivatives of elementary functions, of sum, product, quotient, of composite function (chain rule) and of an implicitly defined function.

- 2.9 Use of L'Hopital rule to find a limit.
- 2.10 Use limits to find horizontal, vertical and slant asymptotes. Use derivatives to find the increasing and decreasing intervals, the critical points and relative extrema, the concavity and inflection points of a function. Utilize the above findings to sketch the graph of the function.
- 2.11 Evaluate the average and instantaneous rates of change and find the velocity and acceleration of a particle moving along a line.
- 2.12 Solve problems involving rates and change.

STANDARD 3: INTEGRAL CALCULUS

Standard: Students demonstrate their knowledge of anti-derivative techniques and problem solving in integral calculus.

Student Performance Expectations: All students who have completed one year of Calculus shall be expected to:

- 3.1 Use techniques of integration including basic integration formulas, integration by substitution, change of variables, and simple integration by parts.
- 3.2 Use integration techniques to find distance and velocity from acceleration with initial conditions and problem solving in growth and decay.
- 3.3 Apply the definite integral concepts such as area, approximations to the definite integral by using rectangles and the limit as a sum.
- 3.4 Use the fundamental theorems of Calculus.
- 3.5 Apply the integral as an average value of a function on an interval, area between curves and volume of a solid of revolution (disks, washers, and shell method) about the X and Y axes or line parallel to the axes. Find the volume of a solid by integrating the area of a known cross-section.
- 3.6 Use Riemann and Trapezoidal sums to approximate definite integrals of functions represented algebraically, geometrically and by tables of values.