AP Calculus
2014-2015

Course Description:
The AP Calculus course is designed for the study of mathematical topics comparable to a first year calculus course at most colleges and universities. Topics covered include functions, limits, methods and applications of differentiation and integration. Students will be administered the AP exam for potential college credit at the conclusion of the course at their own expense.
*This course is weighted according to the policy outlined in the student handbook.

Course Content:
I. Functions, Graphs, and Limits
▪ Analysis of graphs
1. With the aid of technology, graphs of functions are often easy to produce. The emphasis is on the interplay between the geometric and analytic information and on the use of calculus both to predict and to explain the observed local and global behavior of a function.
▪ Limits of functions (including one-sided limits)
1. An intuitive understanding of the limiting process.
2. Calculating limits using algebra.
3. Estimating limits from graphs or tables of data.
▪ Asymptotic and unbounded behavior
1. Understanding asymptotes in terms of graphical behavior.
2. Describing asymptotic behavior in terms of limits involving infinity.
3. Comparing relative magnitudes of functions and their rates of change. (For example, contrasting exponential growth, polynomial growth, and logarithmic growth.)
▪ Continuity as a property of functions
1. An intuitive understanding of continuity. (Close values of the domain lead to close values of the range.)
2. Understanding continuity in terms of limits.
3. Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem).
II. Derivatives
▪ Concept of the derivative
1. Derivative presented graphically, numerically, and analytically.
2. Derivative interpreted as an instantaneous rate of change.
3. Derivative defined as the limit of the difference quotient.
4. Relationship between differentiability and continuity.
▪ Derivative at a point
1. Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents.
2. Tangent line to a curve at a point and local linear approximation.
3. Instantaneous rate of change as the limit of average rate of change.
4. Approximate rate of change from graphs and tables of values.
▪ Derivative as a function

1. Corresponding characteristics of graphs of *f* and
2. Relationship between the increasing and decreasing behavior of *f* and the sign of
3. The Mean Value Theorem and its geometric consequences.
4. Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.
5. Slope fields. Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations.

▪ Second derivatives

1. Corresponding characteristics of the graphs of *f*, , and .
2. Relationship between the concavity of *f* and the sign of .
3. Points of inflection as places where concavity changes.

▪ Applications of derivatives

1. Analysis of curves, including the notions of monotonicity and concavity.
2. Optimization, both absolute (global) and relative (local) extrema.
3. Modeling rates of change, including related rates problems.
4. Use of implicit differentiation to find the derivative of an inverse function.
5. Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration

▪ Computation of derivatives

1. Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
2. Basic rules for the derivative of sums, products, and quotients of functions.
3. Chain rule and implicit differentiation.

III. Integrals

▪ Interpretations and properties of definite integrals

1. Computation of Riemann sums using left, right, and midpoint evaluation points.
2. Definite integral as a limit of Riemann sums over equal subdivisions.
3. Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval:
4. Basic properties of definite integrals. (Examples include additivity and linearity.)

▪ Applications of integrals

1. Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations.

▪ To provide a common foundation

1. specific applications should include finding the area of a region, the volume of a solid with known cross sections, the average value of a function, and the distance traveled by a particle along a line.

▪ Fundamental Theorem of Calculus

1. Use of the Fundamental Theorem to evaluate definite integrals.
2. Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.

▪ Techniques of antidifferentiation

1. Antiderivatives following directly from derivatives of basic functions.
2. Antiderivatives by substitution of variables (including change of limits for definite integrals).

▪ Applications of antidifferentiation

1. Finding specific antiderivatives using initial conditions, including applications to motion along a line.
2. Solving separable differential equations and using them in modeling. In particular, studying the equation and exponential growth.

▪ Numerical approximations to definite integrals

1. Use of Riemann and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.

Required Textbooks and/or Other Reading/Research Materials
Chapters 1-7.

Calculus of a Single Variable AP Edition, Ninth Edition – Larson, Edwards, 2010

Course Requirements:
Each student is required to complete all projects, tests, and assignments. Failure to do so will adversely affect the student's overall grade. All students are required to have an AP Board approved graphing calculator. A list of approved calculators can be found at www.apcentral.collegeboard.com (link: Course Descriptions, link: Calculus AB)

Grade Components/Assessments:
Grades will be based on a point system that will be converted to overall percentages. The following methods will be used to assess and evaluate student performance.

Assessments: 80 %
Homework/Classwork: 15%
Class Participation 5%

Based on our mission of giving every student a chance to reach his/her fullest potential, students will be allowed to make up work missed due to excused absences as stated in the student handbook and are encouraged to get additional help whenever necessary for better understanding of class concepts.

Each marking period is worth 20% of a student's overall grade. The final is worth 20% of a student's overall average:

Quarter 1	20%
Quarter 2	20%
Quarter 3	20%
Quarter 4	20%
Final	**20%**

Required Summer Reading/Assignments:
Students are required to complete a packet of questions reviewing their knowledge of algebraic, geometric, and trigonometric topics learned in previous mathematics courses. The assignment will be graded and students will be quizzed on the unit circle at the beginning of the course.