

Syllabus for AP Calculus AB

Underlying Focus:

The emphasis in AP Calculus is on an intuitive understanding of all concepts and 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. All topics are presented graphically, numerically, and analytically. Students are constantly asked verbally or in writing to explain the meaning of topics, relationships between topics, and problem solutions as well as cite reasons for their responses. Accurate use of terms and complete mathematical notation is stressed. Explanations must be specific to the problem.

Graphing calculators are used throughout the course. Short inserts of graphing calculator instruction on calculator skills and efficient use, as well as reinforcement of the four calculator skills required for the AP Exam, are integrated throughout classroom instruction.

Students (especially athletes, working students, and students on extracurricular overload) are encouraged early in the year to coordinate library study groups and find themselves “study buddies” to work with outside of class and to communicate with if absent in order to stay up to date on lessons and assignments.

The AP Spirit: Throughout classroom instruction, assignments, reviews, and assessments, multiple choice and free-response questions from the College Board are used to enrich the course and prepare students for their final assessment: The AP Test. AP problems are used for class discussions, for students to discuss and complete in group settings, for group assignments over long holidays when “calculus gatherings” are encouraged, and on assessments. Grading is often mirrored after the AP reading.

Assessment: Assessments with and without technology are administered. The following question is asked frequently during problem set discussions: “How do you approach this problem with technology and how would you approach this problem without technology?”

Homework and or activities are assigned daily.

Quizzes are given weekly.

Tests are given approximately every two to three weeks with a total of 6 to 8 per semester.

Tests do not necessarily occur at the end of a unit but are instead more aligned with the school calendar.

AP Calculus AB Course Outline

Unit 1: Review of Precalculus Topics (2 week)

Use of technology

Equations of Lines

Transformations

Functions

Trigonometry

Rational Functions

Piecewise Functions (including Greatest Integer Function)

Exponents

Unit 2: Limits, Unbounded Behavior, and Continuity (3 weeks)

Finding/ Estimating/ Evaluating limits –including one sided limits

Graphically

Numerically

Using tables of data

Analytically

Infinite Limits -- and their relationship to asymptotes

Limits at Infinity – and their relationship to asymptotes

Continuity

Intermediate Value Theorem

Extreme Value Theorem

Unit 3: Derivatives (5 weeks)

Local Linearity discussion using the graphing calculator

Derivative defined as the limit of the difference quotient

Relationship between differentiability and continuity

The Derivative and the Tangent Line Problem

Derivative at a point, as an instantaneous rate of change

Derivatives from graphs and tables of values

Basic Differentiation Rules and Rates of Change

Product and Quotient Rules and Higher-Order Derivatives

The Chain Rule

Trigonometric Derivatives

Particle Motion

Use of the graphing calculator and parametric functions

to simulate a moving particle and generate a schematic diagram

Implicit differentiation

Related Rates

Unit 4: Applications of Differentiation (4 weeks)

Analysis of Function and Derivative Graphs

Characteristics of f , f' , f'' and their relationships

Extrema on an Interval

Rolle's Theorem and the Mean Value Theorem

Increasing and decreasing Functions and the First Derivative Test

Concavity and the Second Derivative Test

Limits at Infinity (revisited)

A summary of Curve Sketching

Optimization Problems

Newton's Method

Differentials

Unit 5: Integrals (4 weeks)

Integration as an accumulation Process

Integration using Numerical Approximations:

Reimann Sums, Trapezoidal Rule, Simpson's Rule

Basic Properties of Definite Integrals

Antiderivatives and Indefinite Integration

Techniques of Integration including change of variables

The Fundamental Theorems of Calculus

Mean Value Theorem

Integration by Substitution

Integration of Trigonometric Functions

Separable Differential Equations

Unit 6: Inverse Functions (3 weeks)

Inverse Functions

The Natural Logarithmic Function: Differentiation

Exponential Functions: Differentiation

The Natural Logarithmic Function: Integration

Exponential Functions: Integration

Bases Other Than e and Applications

Inverse Trigonometric Functions: Differentiation

Inverse Trigonometric Functions: Integration

Unit 7: Applications of Integrals (3 weeks)

The average value of a function

Particle Motion (revisited)

Area of a region between two curves

The volume of a solid with known cross sections,

Volume: The Disk Method

Volume: The Shell Method

Unit 8: Differential Equations (3 weeks)

Slope Fields and Euler's Method

Differential Equations: Growth and Decay

Separation of Variables and the Logistic Equation

Applications of Integrals revisited with Logarithmic and Exponential Functions

AP Test Review (3 weeks)

References and Materials

Primary Textbook

Larson, Ron, Robert P. Hostetler, and Bruce H. Edwards. *Calculus of a Single Variable. 8th ed.* Boston: Houghton Mifflin, 2006

Other Resources

AP Calculus Course Description College Entrance Examination Board 2005

AP Calculus summer institute notebooks

AP Released Exams

Web Resources

AP Central (apcentral.collegeboard.com)