

Calculus AB Syllabus

Course Objective:

AP Calculus is primarily concerned with developing students' understanding of the concepts of Calculus and providing experience with its methods and applications. The course emphasizes a multi-representational approach to calculus, with concepts, results, and problems being expressed geometrically, numerically, analytically and verbally. The connections among these representations also are important. (The College Board – AP Calculus Teachers Guide)

Course Planner

Review: Functions (Chapter 1)

Length of unit: 3 weeks

1. Four ways to represent a function
2. Use of graphing calculators
3. Review of Functions
 - Polynomial functions
 - Rational functions
 - Power functions
 - Logarithmic functions
 - Trigonometric functions
4. Equations and inequalities
5. Transformations
6. Inverses

Limits and Derivatives (Chapter 2)

Length of unit: 4 weeks

1. Speed and distance functions
2. Exploring limits of functions graphically, analytically and numerically
3. Special limits
 - As x approaches infinity
 - When $f(x)$ approaches infinity
4. Continuity
5. Intermediate Value Theorem
6. Tangents
7. Derivatives
8. Linear Approximations using the derivative
9. Introduce relationships between f , f' , and f''
10. Interpretation of f'
11. Second derivative

Rules for Derivation (Chapter 3)

Length of unit: 3 weeks

1. Powers and Polynomials

2. The Exponential Function
3. The Product and Quotient Rules
4. The Chain Rule
5. The Trigonometric Functions
6. Applications of the Chain Rule and Related Rates
7. Implicit Functions
8. Linear Approximations
9. Applications
 - position, velocity, acceleration
 - relationships between f , f' , and f''

Application of the Derivatives (Chapter 4)

Length of unit: 4 weeks

1. Related Rates
2. Optimization Problems
3. Slopes of Curves
 - Slopes and Concavity
4. Mean Value Theorem
5. Introduction of Antiderivatives

Integrals (Chapters 5, 6, and 7)

Length of unit: 3 weeks

1. Definite Integrals
 - Definition
 - Interpretation as the area under a curve
 - Evaluation using the definition
 - Fundamental Theorem of Calculus
 - Evaluating definite integrals
2. Ways to Approximate Integrals
 - Riemann Sums

Constructing Antiderivatives (Chapter 6)

Length of unit: 3 weeks

1. Antiderivatives Graphically and Numerically
2. Constructing Antiderivatives Analytically
 - Indefinite integral
3. Differential Equations
4. Second Fundamental Theorem of Calculus

Applications of Integrals (Chapter 8)

Length of unit: 3 weeks

1. Integrals as area under and between curves
2. Volumes of Revolution
3. Volumes of Solids with given cross-sectional area
4. Mean Value Theorem
 - Average Value of a Function

Differential Equations (Chapter 11)

Length of unit: 3 weeks

1. Modeling using Differential Equations
2. Slope fields
3. Separable Equations
4. Applications

Review and Preparation for the AP Exam

1. Practice questions are given, scored and analyzed,
2. Practice questions are done in groups and individually.
3. Students also take a “practice AP Exam” as a final exam before the actual test.

Teaching Strategies

1. Group work
2. Technology
 - Geometer's sketchpad demonstrations
 - Graphing calculators
3. Direct instruction
4. Grounding theory in real-life applications
 - Emphasize common and intuitive applications such as distance/velocity/acceleration
5. Student-led discussions
 - Students describing their own approach to a problem
 - Student presentations of class problems

Technology and Computer Software

Graphing calculators are used on a daily basis. Students each have their own calculator. Most students have TI-83 or TI-84. They are taught how to use calculators as a tool in the context of how to solve a problem and present a logical solution. The calculator is a natural extension of the mathematics students already know. Students come into the class or are quickly taught: how to graph a function with an appropriate window, find roots and points of intersection. As the class progresses students use the calculator to numerically find derivatives and definite integrals. Tests have both calculator and non-calculator sections since the calculator is only one tool that students are expected to master.

Primary Textbook

Hughes-Hallet et al.. *Single Variable Calculus*. 3rd ed. John Wiley & Sons, Inc. 2002.

Other Resources

AP Calculus Course Description

AP Released Exams

Calculus in Motion Geometers Sketch Pad Demonstrations

Student Evaluation

- Unit Tests
 - 1-2 Test per Chapter with calculator and non-calculator sections as well as multiple choice and free-response questions
- Group Tests with previous years' AP free response questions
- Quizzes
- Group Poster Presentations of Key Ideas in Calculus