

AP Calculus AB

Classroom Environment and Course Overview

Because of the difficulty of calculus, students must apply themselves both inside and outside the classroom in order to succeed. The challenges of AB Calculus require that these exceptional students work even harder and more efficient than they have in past courses. I attempt to create an encouraging environment while exposing these students to difficult AB problems and concepts.

Most Calculus AB students have demonstrated strong mathematical skills in previous math classes. It is my belief that in order for the students to gain understanding of the AB topics, they must go beyond basic computation. I encourage them to question, analyze and work together so that they may attain a high level of mastery in the AB Calculus curriculum.

I also expect that all students will be able to communicate their understanding of calculus written and verbally, and to connect the concepts of calculus graphically, analytically, and numerically.

Course Planner

Primary Textbook

Larson, Ron, and Bruce H. Edwards. *Calculus: AP Edition*. 9th ed. Belmont, Calif.: Brooks/Cole, Cengage Learning, 2010. Print.

Preliminaries

2 weeks

- 1) Lines
- 2) Functions and Graphs
- 3) Exponential Functions
- 4) Inverse Functions and Logarithms
- 5) Trigonometric Functions and their Inverses

Limits and Continuity (Chapter 1)

2 weeks

- 1) Finding Limits Numerically and Graphically
- 2) Evaluating Limits Analytically
- 3) Continuity and One-Sided Limits
- 4) Infinite Limits
- 5) Limits at Infinity

Derivatives (Chapter 2)

4 weeks

- 1) Derivative and Tangent Lines
- 2) Derivative as a Rate of Change and Basic Differentiation Rules
- 3) Derivatives of Products and Quotients and Higher Order Derivatives
- 4) The Chain Rule
- 5) Implicit Differentiation
- 6) Related Rates

Applications of Derivatives (Chapter 3)

4 weeks

- 1) Extrema on an Interval
- 2) The Mean Value Theorem
- 3) Increasing and Decreasing Functions and the First Derivative Test
- 4) Concavity and the Second Derivative Test
- 5) A Summary of Curve Sketching
- 6) Optimization Problems
- 7) Newton's Method
- 8) Differentials

Integration (Chapter 4)

4 weeks

- 1) Indefinite Integration and Antiderivatives
- 2) Riemann Sums and Definite Integrals
- 3) The Fundamental Theorem of Calculus
- 4) Integration of Substitution
- 5) Numerical Integration

First Semester Final**Logarithmic, Exponential, and Other Transcendental Functions (Chapter 5)**

3 weeks

- 1) The Natural Logarithmic Function and Differentiation
- 2) The Natural Logarithmic Function and Integration
- 3) Inverse Functions
- 4) Exponential Functions: Differentiation and Integration
- 5) Inverse Trigonometric Functions: Differentiation
- 6) Inverse Trigonometric Functions: Integration

Differential Equations (Chapter 6)

2 weeks

- 1) Slope Fields and Euler's Method
- 2) Differential Equations: Growth and Decay
- 3) Separation of Variables and the Logistic Equation
- 4) First-Order Linear Differentiation Equations

Applications of Integration (Chapter 7)

3 weeks

- 1) Area of a Region Between Two Curves
- 2) Volume: The Disc Method
- 3) Volume: The Shell Method
- 4) Arc Length and Surfaces of Revolution

Integration Techniques and L'Hôpital's Rule Part 1 (Chapter 8)

10 days

- 1) Basic Integration Rules
- 2) Indeterminate Forms and L'Hôpital's Rule

Review for Calculus AB Exam

25 days

AP Testing**Integration Techniques and L'Hôpital's Rule Part 2 (Chapter 8)**

- 1) Integration by Parts
- 2) Trigonometric Integrals
- 3) Trigonometric Substitution
- 4) Partial Fractions

Teaching Strategies

It is my goal as a teacher that all students taking the AP Calculus course master the basic concepts of calculus, develop good study skills, pass the Calculus AB exam and are well equipped for college mathematics.

Students are encouraged to ask others for help in understanding and comparing and contrasting methods. I believe that the kind of learning that comes from smaller group interaction, either from teacher determined groups during class, or study groups outside of class. I believe that when students have the opportunity to talk about points of confusion and discuss the concepts of calculus between them, they understand the concepts at a new level.

I also believe it's important for students to be able to verbalize the content. I will incorporate student groups present their work to the class and explain their process. When the students explain their work to the class, they become much more confident with the material and their classmates are more receptive to the material.

The graphing calculator is used on a consistent basis. The Ti-Nspire calculator helps the students get a grasp on concepts that are otherwise very abstract and difficult to visualize. For any student that does not have a Ti-Nspire, there is a class set that they can utilize during class. I also use Wolfram Demonstrations to show different concepts in a visual manner, often concepts that are better viewed in motion or in 3D.

Student Evaluation

Students are evaluated on a consistent basis. Short quizzes are administered at least weekly, and usually assess the material covered in the previous two or three days. At the end of each unit, a major test is administered to the students. There is one take home test each of the first three quarters that will include questions developed from previous AP tests. Students are encouraged to talk with one another about their ideas, but to write their own solutions to turn in.

As the year goes on, the unit tests increasingly incorporate a combination of multiple choice and free response questions. These tests are meant to get students acquainted with the format of the AP Exam.

A final exam is administered at the end of each semester. This exam is approximately 10 percent of the student's grade. The exam evaluates the student's knowledge of all the material covered during the 18 week semester.

Homework is assigned on a consistent basis. The homework is designed to guide the students through the material that will be covered on the quizzes and the unit test. Though students receive credit for homework, the majority of their grade is determined by quizzes, unit tests and the final exam.