

AP Calculus AB

Part I: Course Parameters

Course Title: AP Calculus AB

Prerequisite: B or above in Precalculus (or equivalent)

Text: *Calculus*, Larson, Hostetler and Edwards, Houghton Mifflin, 1998

Course Description: AP Calculus (AB) consists of a full high school academic year of work, which is comparable to Calculus courses in colleges and universities. Students who take AP Calculus may seek college credit, placement, or both, from institutions of higher learning. Graphing calculators are an essential tool in the course, and will be used on the exam.

Materials used: TI 83 Graphing Calculator. This calculator has a built-in capability to (1) plot the graph of a function within an arbitrary viewing window; (2) find the zeros of functions; (3) numerically calculate the derivative of a function, and (4) numerically calculate the value of a definite integral.

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Part II: Processes

■ Collaboration

- Students work in pairs and small groups to solve problems.

■ Communication

- Students must explain the processes used to solve problems in calculus.

■ Critical Thinking

- The very essence of the course is problem solving through critical thinking.

■ Application

- Students learn practical applications of calculus problems, and a number of the practice problems are stated in real work settings.

■ Organization

- Because this is a strenuous university level course, students must plan their study time and keep careful notes and records.

Part III: Expanded Assessment:

The focus of this AP course is the Advanced Placement Exam given in May of each year. Leading up to this exam the students will take a number of practice exams, including AP exams from previous years.

Part IV: Critical Questions

- Is mathematics a science? Is there beauty in mathematics?
- Is calculus an extension of algebra, or is it a separate field of study?
- What are common uses of calculus?

Part V: Course Outline and/or Student Outcomes

- I. Functions, Graphs, Limits
- Analysis of graphs
 - Limits of functions, including one-sided limits
 - Calculating limits using algebra
 - Estimating limits using graphs or tables of data
 - Asymptotic and unbounded behavior
 - Understanding asymptotes in terms of graphical behavior
 - Describing asymptotic behavior in terms of limits involving infinity.
 - Continuity as a property of functions
 - Understanding continuity in terms of limits
 - Geometric understand of graphs of continuous functions.
- II. Derivatives
- Concept of the derivative
 - Derivatives presented numerically, and analytically
 - Derivative interpreted as an instantaneous rate of change
 - Derivative define as the limit of the difference quotient
 - Derivative at a point
 - Slope of a curve at a point
 - Tangent line to a curve at a point
 - Instantaneous rate of changes as the limit of average rate of change.
 - Approximate rate of change from graphs and tables of values
 - Derivative as functions
 - Second derivatives
 - Applications of derivatives
 - Slope Fields
- III. Integrals
- Interpretations and properties of definite integrals
 - Computation of Riemann sums
 - Basic properties of definite integrals
 - Applications of integrals
 - Fundamental Theorem of Calculus
 - Use of Fundamental Theorem to evaluate definite integrals
 - Use of the Fundamental Theorem to represent antiderivatives
 - Techniques of antidifferentiation
 - Antiderivatives following directly from derivatives of basic functions
 - Antiderivatives by substitution of variables
 - Applications of antidifferentiation

Part VI Assessment

Students' grades will be determined by:

Problems and Assignments	50%
Tests and Quizzes	50%

Part VII Useful References

<http://www.collegeboard.org/ap/students/index.html> For an explanation of AP in general and AP Calculus in particular.

<http://forum.swarthmore.edu> In my opinion the best website on the Internet. This site is a searchable clearinghouse of information on mathematical sites on the web. This is a very useful site to browse or search for a specific topic.