# **AP Calculus AB Course Syllabus**

Presented by

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Number crunching and symbol manipulation are only small parts of learning calculus. Conceptual understanding of topics is also important. One of the major goals is for the students to learn how to use precise language to describe these concepts and the relationships between ideas.

## **Course Planner**

## **Primary Textbook**

Finney, Ross L., Franklin Demana, Bert Waits, and Daniel Kennedy. *Calculus: Graphical, Numerical, Algebraic.* Reading, Mass.: Addison Wesley, 1999.

The chapter numbers follow the textbook.

This course is taught over two terms on a five period day.

## Chapter 1: Prerequisites for Calculus (7 days)

- 1• Elementary functions:
  - 00 Linear, power, exponential/logarithmic, trigonometric/inverse trigonometric
- 2• Parametric equations
- 3. Getting familiar with the graphing calculator

## Chapter 2: Limits and Continuity (6 days)

1• Limits:

Oo Limit at a point, limit at infinity, infinite limits

- 1o Properties of limits
- 2• Continuity
- 3• Tangent line to a curve
- 4. Slope of a curve at a point

## Chapter 3: Derivatives (16 days)

- 1. Definition of f'
- 2. Derivative at a point
- **3** Relating the graphs of f and f'
- **4** Where does f'(a) fail to exist?
- 5. Rules for differentiation:
  - o Sum, product, and quotient
  - Chain Rule
  - 1. Implicit differentiation
  - 2• Derivatives of trigonometric, inverse trigonometric, exponential and logarithmic functions

## Chapter 4: Applications of Derivatives (12 days)

- 1• Mean Value Theorem
- 2• Using the derivative to find:
  - 00 Critical point(s) and extreme values
    - 10 When the function is increasing or decreasing
    - 20 Point(s) of inflection
  - 30 When the function is concave up or concave down
- 3• Optimization problems
- 4. Using the tangent line to approximate function values
- 5• Differentials and change
- 6• Related rates

## Chapter 5: The Definite Integral (10 days)

- 1• RAM (Rectangle Approximation Method)
- 2• Riemann sums
- 3• Finding an antiderivative

- 4• Using a definite integral to find area, volume, average value of a function
- 5• Fundamental Theorem of Calculus
- 6• Approximating the definite integral:

00 Trapezoidal Rule, Simpson's Rule, Error Analysis

#### Chapter 6: Differential Equations and Mathematical Modeling (12 days)

- 1• Slope fields
- 2. Antiderivatives and the indefinite integral
- 3• Techniques of integration:
  - 00 Substitution and integration by parts
- 4. Separable differential equations
- 5• Exponential growth and decay
- 6• Logistic growth

## Chapter 7: Applications of Definite Integrals (10 days)

- 1. Using the definite integral to discuss:
  - 00 Net change-motion on a line, consumption over time
  - 10 Area, volume, length of a curve, surface area of a solid of revolution
  - 0o Work

#### Final Exam and Review (8 days)

In this course, students take a comprehensive final exam in similar format to the AP Exam. This exam consists of both free response and multiple choice questions, including calculator and noncalculator portions.

#### **Review for AP Exam**

Students who do not continue in the AP Calculus BC course attend review sessions during the month before the AP exam to review for the exam

## **Teaching Strategies**

## **AP Calculus AB Course Description**

The topic outline shown above is the skeleton of our course. We study every area mentioned in the *AP Calculus AB Course Description*. We also include some other topics— Simpson's Rule, integration by parts, volume by cylindrical shells, and work—as an extension and preparation for AP Calculus BC.

#### **Functions from Multiple Representations**

Students will study functions graphically and analytically. Students will be required to communicate mathematics both verbally and in written form and will be asked to justify and interpret solutions as well as explain techniques and concepts in class, on homework assignments, and on exams.

Students will be working collaboratively in small groups on released AP Calc free response questions throughout the course. After completing a problem, groups will make presentations on how they went about solving the problems and will self assess their work based on the AP rubric released with the questions. This will give students practice at communicating mathematics verbally and in written form and will give them the experience with how their responses will be graded prior to the exam.

#### Use of Technology

Students will be using graphing calculators and computer programs such as Winplot and Mathematica to explore, make conjectures, provide visualizations, support solutions, and perform calculations in class, on homework assignments, and on tests.

Use and understanding of the graphing calculator will essential to be successful in this course.

#### **Student Evaluation**

Students will be evaluated in part by their daily work but mainly by tests. Each test will be constructed in an AP type format including both multiple choice and free response question and will have both a calculator and noncalculator portion. Either previously released exam questions or questions closely mirroring previously released exam questions will be used on chapter tests.

#### Web Resources

1. AP Central (apcentral.collegeboard.com)