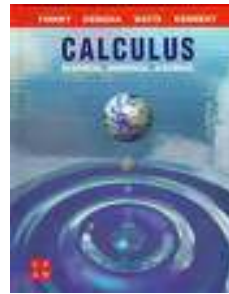


# Syllabus



**COURSE NUMBER:** 3900

**YEAR:** 2007/2008

**COURSE TITLE:** ADVANCED PLACEMENT CALCULUS

**INSTRUCTOR:** Mr. Czaplewski

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## I. GRADING:

I will use a standard grading scale 90%'s = A's, 80%'s = B's and so on. The top 3 % from each group will be the plusses (90-93=A-) and the bottom 3% the minuses. Each chapter will have two tests one in class at one take-home. There will be a small effort grade given at the end of each quarter given for completed homework etc. The vast majority of your grade will be determined by your tests and quizzes just like a college class would be graded. There will be other graded packets and projects outlined below.

## II. HOMEWORK:

Homework will be assigned everyday. It is expected that you finish all your homework. Most classes I will just go over the answers to the assignments and answer questions. A few times per week I will check to see that your assignment is done.

## III. AP PACKETS:

Approximately once a month I will hand out a packet, which has AP type questions. You are to do the packets when you have extra time. I highly recommend that you do not wait until the day before the packet is due to start working on it. Each packet takes around 5-6 hours to complete depending on how much you remember and how much you need to look up.

## IV. CHEATING VERSES HELPING EACH OTHER:

When you get stuck on homework or an AP packet I expect that you look information up and work with each other. However, I do not want you to just copy another's paper. This will result in a zero for that assignment with no make-up. *Acceptable helping strategy:* "Hey how did you do problem # 31" *Unacceptable:* "Let me see your homework," then proceed to copy the problem. You will find out very quickly that this class is about learning how to do calculus and how it all fits together. It is not about memorizing how to do a problem and do a similar problem by having a certain method memorized.

## V. THE AP EXAM:

Although it is not required it is highly recommended that you take the exam. At the conclusion of this class you should be well versed in all the material and should do well enough to pass the exam.

## VI. SCHOOL FINAL EXAM:

Since the goal of this class is to get college credit you will not be able to exempt first semester's exam. This exam is written to help get you ready for the actual AP exam and is a good learning experience. The bonus for taking this exam is the fact that there will be no second semester school exam. "Everyone is automatically exempt!"

## VII. EXTRA HELP:

When you begin to struggle with the material get in and see me. I'm available every day before school and when volleyball ends I'll be available most days after school.

## VII. EXAM PREPERATION SATURDAY:

One of the most meaningful reviews that I do to help you prepare for the exam is to hold a Saturday review day. One Saturday in (or around) April, I will have my class come in to take a full length exam. The exam is approximately three and one-half hours long. We will then break for lunch and then spend about 1-2 more hours correcting the exam. This is a very important day that you really need to be present for. Each year most of my students believe that this was the single most important day for them to get ready for the exam.

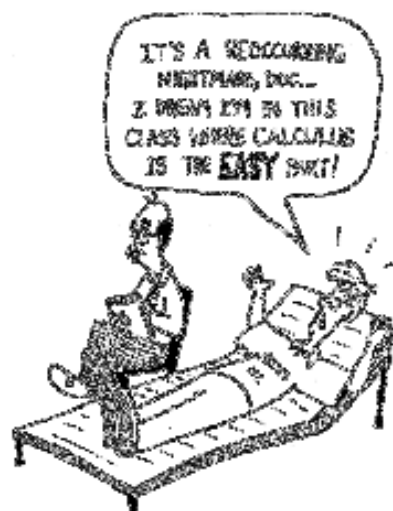
## IX. COMMITMENT:

This is a difficult class. It is a difficult college class, which makes it a very difficult high school class. I expect you to be committed and do your homework, projects and all assigned material. As long as you have that commitment, you will do well.

## X. MY WEBSITE:

You will find some help with this class including all my assignments listed on my website.

The url is: [www.geocities.com/mathczap](http://www.geocities.com/mathczap)



## Course Design and Philosophy

Understanding the concepts of Calculus will allow students to do their best work. Prior to Calculus many students do well in their math classes by memorizing algorithms and reproducing them on evaluations. From the beginning of the course, the reasons behind the major ideas are stressed, rather than listing a set of skills to be memorized. If they understand these reasons students can learn how to problem solve rather than to “regurgitate” information. As the Calculus concepts are developed, an explanation of the Calculus skills needed to address these topics are presented.

## Teaching Strategies

Throughout each lesson a constant effort is made to connect each topic using analytic, graphic, numerical and verbal methods. Students will use investigative techniques to approach topics using the above four methods, enabling them to further their understanding of the mathematics. Students will not only be responsible for understanding the Calculus topics, but will be required to communicate those ideas and their applications in a concise manner. Students are expected to explain problems using proper vocabulary and mathematical terms.

## Graphing Calculator Uses

A College Board approved graphing calculator is required for this class. A TI-89 is not required for this class but its use is strongly encouraged to help with the understanding of the Calculus topics. Since the AP Exam consists of a calculator part and a non-calculator part, many of my tests will follow the same format. The calculator will be used as a tool to further illustrate the topics and show how technology can shorten many tedious tasks. Students will be able to see whether or not the results are reasonable and fit the criteria in the problem. The four required functionalities that follow will be reviewed as new topics are introduced.

- A. Students will be able to discover a root (zero) of a function and apply that graphically or numerically.
- B. Using specified domains and ranges students will generate the graphs of specific functions.
- C. Students will use numerical methods to approximate a derivative at a point.
- D. Students will use numerical methods to approximate the value of a definite integral.

## Textbook

Finney, Ross L., Franklin D. Demana, Bert K. Waits, and Daniel Kennedy.  
*Calculus-Graphical, Numerical, Algebraic*. 1<sup>st</sup> ed. Menlo Park: Scott-Forseman  
Addison-Wesley, 1999.

# AP CALCULUS TOPICAL OUTLINE

## Unit 1: Limits and Continuity (14 days)

- A. Rates of Change and Limits
  - 1. Average vs Instantaneous Speed
  - 2. Definition of a Limit
  - 3. One Sided Limits
  - 4. Sandwich Theorem
- B. Limits Involving Infinity
  - 1. Asymptotes (Vertical and Horizontal)
  - 2. End Behavior Models
- C. Continuity
  - 1. Continuity at a Point
  - 2. Continuous Functions
  - 3. Intermediate Value Theorem
- D. Rates of Change and Tangent Lines
  - 1. Average Rates of Change
  - 2. Limit Definition of Slope of a Curve at a Point

## Unit 2: Derivatives (27 days)

- A. Derivative of a Function
  - 1. Limit Definition of Derivative
  - 2. Graphs of Derivatives
  - 3. One Sided Derivatives
- B. Differentiability
  - 1. Local Linearity
  - 2. Differentiability vs. Continuity
- C. Rules for differentiation
  - 1. Derivative Rules (Includes: Power Rule, Product Rule and Quotient Rule)
- D. Velocity and Other Rates of Change
  - 1. Instantaneous Rate of Change (Derivative)
  - 2. Speed
  - 3. Acceleration
  - 4. Motion Problems
  - 5. Applications to Economics
- E. Derivatives of Trigonometric Functions
  - 1. Rules for Basic Trig. Functions
  - 2. Jerk
- F. Chain Rule
  - 1. Composite Functions and the Chain Rule
  - 2. Parametric Derivatives
- G. Implicit Differentiation
- H. Derivative of Inverse Trigonometric Functions
- I. Derivative of Exponential and Logarithmic Trigonometric Functions
  - 1. "e"
  - 2. Logarithmic Differentiation
  - 3. Other Exponential Functions

### **Unit 3: Applications of Derivatives (18 days)**

- A. Extreme Values of Functions
  - 1. Absolute (Global) Max's and Min's
  - 2. Local Max's and Min's
  - 3. Critical Points
- B. Mean Value Theorem
  - 1. MVT
  - 2. Increasing and Decreasing Functions
  - 3. Antiderivative
- C. Connecting the First and Second Derivatives with the Graph of the Original Function
  - 1. First Derivative Test
  - 2. Concavity
  - 3. Inflection Points
  - 4. Second Derivative Test
- D. Modeling and Optimization
  - 1. Strategies for Solving
  - 2. Max and Min Problems
- E. Linearization and Newton's Method
  - 1. Linearization
  - 2. Newton's Method
  - 3. Differentials
- F. Related Rates

### **Unit 4: The Definite Integral (16 days)**

- A. Estimating with Finite Sums
  - 1. Total Distance
  - 2. RAM
- B. Definite Integrals
  - 1. Riemann Sums
  - 2. Notation
  - 3. Area Under a Curve
  - 4. Integrals on a Calculator
- C. Definite Integrals and Antiderivatives
  - 1. Rules for the Definite Integral
  - 2. Average Value of a Function
- D. Fundamental Theorem of Calculus
  - 1. Part 1
  - 2. Part 2
- E. Trapezoidal Rule
  - 1. Trapezoidal Rule
  - 2. Simpson's Rule

## **Unit 5: Differential Equations and Mathematical Modeling (18 days)**

- A. Antiderivatives and Slope Fields
  - 1. Initial Value Problems
  - 2. Integral Formulas
- B. Integration by Substitution
  - 1. Power Rule
  - 2. Integral Trig. Formulas
  - 3. Substitution in Definite Integrals
- C. Integration by Parts
- D. Exponential Growth and Decay
  - 1. Law of Exponential Change
  - 2. Newton's Law of Cooling
- E. Population Growth

## **Unit 6: Applications of the Definite Integral and Other Topics (20 days)**

- A. Integral as Net Change
- B. Areas in the Plane
  - 1. Areas Between Curves
  - 2. Integration with Respect to  $y$
- C. Volumes
  - 1. Cross Sections
  - 2. Disk Method
  - 3. Washer Method
  - 4. Shell Method
- D. Lengths of Curves
- E. L'Hopitals Rule