

## A.P. Calculus AB Syllabus

Teacher: Mrs. Cuba 2008-2009

Room: S109

Philosophy: Calculus is basically the study of change. You will learn how mathematics answers science's plea for solutions to questions of rates of change in population growth, interest income, distance traveled, and more. We will take a team approach to learning the concepts of calculus together using technology as an aid. Relax, enjoy, and work hard and we will have a fabulous journey to understanding the power of calculus together!

Required Materials: You need to bring to class daily your textbook, graphing calculator and your preferred style of notebook. We will also be using our A.P. preparation workbooks as announced.

Assessment: Ninety percent of your grade is based on your work on comprehensive tests, quizzes, and graded assignments. Partial credit is given based on shown work. Tests are worth two or three times more points than quizzes or graded assignments. The remaining ten percent of your grade is based on your work on daily written assignments. All of these assignments should be done in pencil and kept in your notebook. You must label the assignment with the page number and problem number and include the work for each problem, not just the answer. Each assignment is due at the beginning of the class period. It is graded as follows: 4 points - completely done and on time  
3 points - partially done on time  
2 points - late and completely done  
1 points - late and partially done  
0 points - not done

In May, the AP test will be taken by **all** students. In addition, the SAT Math Level 2 exam will also be taken if not already done satisfactorily.

Classroom Expectations: Our class time is limited! It is therefore expected that during class you will **be attentive, maintain a positive attitude, put forth your best effort, and respect others.**

## Tentative AP Calculus AB Schedule

### Week Chapter(s) Topic(s)

1 1 Pre-requisites for Calculus  
2 2 Limits and Continuity  
3 2 Limits and Continuity  
4 2 Continuity; Test  
5 3 Derivatives  
6 3 Differentiability  
7 3 Derivative Rules  
8 3 Derivative Rules  
9 3 Derivatives  
10 3 Derivatives  
11 1-3 Review  
12 1-3 Review and Exam

### ----- Second Trimester

1 3 Derivatives of Logs.; Test  
2 4 Curve analysis  
3 4 Curve analysis  
4 4 Optimization  
5 4 Linearization; Related Rates  
6 4 Related Rates; Test  
7 5 RAM of Finding Area  
8 5 Definite Integrals; F.T.C.  
9 5 Integration; Trapezoidal Rule  
10 5 Review and Test  
11 6 Slope Fields

### ----- Third Trimester

1 6 Integration Techniques  
2 6 Differential Equations  
3 6&7 Test; Area under curves  
4 7 Area between and under curves  
5 7 Area under curves ; Volume

- 6 1-7 Review for A.P. Exam
- 7 1-7 Review for A.P. Exam
- 8 1-7 Review for A.P. Exam
- 9 1-7 Review for A.P. Exam
- 10 1-7 A.P. Exam
- 11 6 Int. by Parts and Part. Frac.

## A.P. Calculus Course Outline

### I. **Prerequisites for Calculus** (It is recommended that students review this material over the summer to be fully prepared for this course.)

1. Lines
2. Functions and Graphs – polynomial, exponential, parametric, logarithmic, trigonometric, and piece-wise.
3. Basic Techniques of the Graphing Calculator – all students have a graphing calculator; the model of choice is a TI-84 Plus; calculators are used throughout the course to aid in problem solving and students are taught how to best use it to experiment, interpret results, and support their solutions

### II. **Limits and Continuity**

1. Rates of Change – emphasizing the difference between average and instantaneous using tables and graphs
2. Definition of Limit and its Properties – including one-sided limits and The Sandwich Theorem
3. Limits Involving Infinity – including end behavior models and asymptotes
4. Continuity – including types of discontinuity which are explored graphically and the Intermediate Value Theorem
5. Rates of Change Revisited – an introduction to derivatives through graphical and numerical approaches to instantaneous rates of change

### III. **Derivatives**

1. Definition – including variations, one-sided derivatives, and graphing techniques
2. Differentiability – when derivatives exist and do not exist; how the calculator finds derivatives; differentiability implies continuity
3. Differentiation Rules – including second and higher order derivatives
4. Velocity – analysis of up and down and left and right motion
5. Derivatives of Trigonometric, Inverse Trigonometric, and Exponential Functions
6. Composition and the Chain Rule – including parametrized curves
7. Implicit Differentiation

#### **IV. Applications of Derivatives**

1. Extreme Values – finding relative(local) and absolute(global) extrema
2. Mean Value Theorem – geometric interpretation
3. Increasing and Decreasing behavior and how it relates to the derivative
4. First and Second Derivative Tests for Extrema
5. Concavity and Points of Inflection
6. Relating  $f$ ,  $f'$ , and  $f''$  in tables and graphs
7. Optimization – applications to business, industry, and science
8. Linearization, Newton's Method, and Differentials
9. Related Rates

#### **The Definite Integral**

1. Riemann Sums – explored using graphing technology and programs – including LRAM, RRAM, and MRAM
2. Definite Integrals – basic properties, notations, calculator usage, and numerical approximations using tables and graphs
3. Average Value and Connections between Differential and Integral Calculus
4. Fundamental Theorem of Calculus – including its connection to area and the analysis of antiderivatives in graphical form
5. Trapezoidal Rule

#### **VI. Differential Equations and Mathematical Modeling**

1. Slope Fields – including the interpretation of differential equations
2. Antidifferentiation – including those following directly from basic functions and by substitution
3. Exponential Growth and Decay – including solving separable differential equations, laws of exponential change, and applications to business and science
4. Logistic Growth

#### **VII. Applications of Definite Integrals**

1. Area Between Curves and Enclosed by Curves
2. Volume – including discs, washers, shells, and cross-sectional slices
3. Application of the Integral in Science and Industry – including motion, work, and net changes in data

#### **VIII. Topics after the A.P.Exam (Selections from the following list as time permits.)**

1. Integration by Parts
2. Logistic Growth
3. Integration by Partial Fractions
4. Lengths of Curves
5. Sequences
6. L'Hopital's Rule
7. Improper Integrals