A.P. Calculus BC Syllabus

Teacher: Mrs. Cuba 2009-2010
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. Partial credit is given based on shown work. The remaining ten percent of your grade is based on your work on daily written assignments and selected graded assignments. All daily 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. See the student handbook for other Linden Hall grading policies.

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 BC Schedule

** Chapters 1 and 2 of the text are completed independently before school begins.

Week	Chapter(s)	Topic(s)
1	3	Derivatives
2	3	Differentiability
3	3	Derivative Rules
4	3	Derivative Rules
5	3	Derivatives of Logs.
6	3 & 4	Test; Curve Analysis
7	4	Curve Analysis
8	4	Optimization; Linearization
9	4	Related Rates; Test
10	5	RAM of Finding Area
11	5	Definite Integrals; F.T.C.
12	5 & 6	Trap. Rule; Test; Slope Fields
------	Second Trimester	
1	6	Integration Techniques
2	6	Differential Equations
3	6 & 7	Test; Area under Curves
4	7	Area between Curves; Volume
5	7	Logistics Growth; Curve Length
6	7 & 8	Science Apps.; Test; Sequences
7	8	L'Hopital's Rule; Growth Rates
8	1-8	Review and Exam
9	8 & 9	Improper Integrals; Power Series
10	9	Power Series
11	9	Power Series; Taylor Series
------	Third Trimester	
1	9	Taylor Series; Taylor's Theorem
2	9	Convergence
3	9 & 10	Convergence; Test; Parametrics
4	10	Vectors in the Plane
5	10	Polar Functions
6	all	Review for A.P. Exam
7	all	Review for A.P. Exam
8	all	Review for A.P. Exam
9	all	Review for A.P. Exam
10	all	A.P. Exam
11		Differential Equations

A.P. Calculus BC Course Outline

I. Prerequisites for Calculus (This is to be done prior to the start of this course.)

1. Lines
2. Functions and Graphs – polynomial, exponential, parametric, logarithmic, trigonometric, piece-wise, polar, and vector.
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 problems solving and students are taught how best to use the calculator to experiment, interpret results, and support solutions

II. Limits and Continuity (This is to be done prior to the start of this course.)

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 (Approximately 28 days)

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, Exponential, Parametric, Polar, and Vector Functions
6. Composition and the Chain Rule – including parametrized curves
7. Implicit Differentiation

IV. Applications of Derivatives (Approximately 15 days)

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

V. The Definite Integral (Approximately 16 days)

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 (Approximately 20 days)
1. Slope Fields – including the interpretation of differential equations and numerical solutions using Euler's Method
2. Antidifferentiation – including those following directly from basic functions, by substitution, by parts, and simple partial fractions
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 (Approximately 17 days)
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
4. Lengths of Curves

Sequences, L'Hopital's Rule, and Improper Integrals (Approximately 8 days)
1. Sequences – definition, types (arithmetic and geometric), graphing sequences, and finding limits
2. L'Hopital's Rule – indeterminate forms and use to compare growth rates
3. Improper Integrals – definition, evaluation, use of L'Hopital's Rule to determine convergence, comparison test, and applications

Infinite Series (Approximately 23 days)
1. Concept of Series – infinite series as a limit of a sequence of partial sums
2. Series of Constants – geometric series, harmonic series, p-series, and alternating series
3. Taylor Series – including the series for sin x and cos x, the Maclaurin Series, Taylor Series generated by f at $x = a$, and differentiation and antidifferentiation to determine new series
4. Taylor's Theorem – including the Lagrange form of the remainder
5. Radius of Convergence – including the Nth Term Test, Comparison Test, and Ratio Test
6. Convergence at Endpoints – discussion of the Integral Test, the P-Series Test, the Limit Comparison Test, and the Alternating Series Test