AP Calculus AB

Course Description - We cover all the topics required by the AP Calculus Course Description book published by the College Board. Students are encouraged to participate in the AP Test at the end of the year. College credit may be earned with a high enough score on this AP Test. Since this course is designed to earn college credit, it will be taught with all the expectations of a college course.

Grading - Grades for each quarter will be averaged from tests, quizzes, projects, graded assignments, etc. Grades will be calculated by the total points method and converted to a percentage. The following curve will be used to determine the letter grade:

90-100 A; 80-89 B; 70-79 C; 60-69 D; 0-59 F

Semester grades are averaged as follows:

Quarter 1 - 40%, Quarter 2 - 40%, Semester Exam - 20%, etc.

Graphing Calculators - A graphing calculator is required for this course. I recommend the TI-83 for most students. Students who cannot purchase one will have one provided by the school. Calculators are used daily to explore concepts, solve problems, interpret results of problems, and to support conclusions drawn from assignments and discussions. In addition, some programming is done to compare program structure to algebra. Programs are developed for problems that have many steps which are always similar in nature. Students are required to complete one assignment using a text document with a math editor and with screen snapshots from the calculator used to support a solution. Students may purchase a TI-89 if they choose, but I reserve the right to not allow it to be used for certain quizzes where I am evaluating a performance task.

Classroom Organization - Lecture is conducted through class discussions and explorations which I facilitate. I try to guide students toward discovery instead of strict lecture. In class discussion, proper mathematical terms and vocabulary must be used. Students are seated in partners of 2 per table. I encourage students to work with partners or in groups. Expect many application problems! I like to support each concept with word problems.

Concepts - A complete list of topics and estimated timeline is attached to the back.

Primary Text -

Larson, Hostetler, Edwards. *Calculus 7 th Ed.* Boston: Houghton Mifflin, 2002

Supplemental Resources -

Thomas, Finney, Weir, Giordano. *Thomas' Calculus* 10 th Ed. Boston: Addison Wesley, 2001

Stewart, James. *Calculus* 5e USA: Thomson, Brooks/Cole, 2003

Yunker, Elswick, Vannatta, Crosswhite. *Advanced Mathematical Concepts* Ohio: Merrill, 1986

Calculus Prerequisites		
Text	Topic	Days
P1	Graphs and Models	1
P2	Linear Models and Rates of Change	1
P3	Functions and Their Graphs	1
P4	Fitting Models to Data - We use the stat function on the calculator to list	2
	the data, graph a scatter plot, set a proper viewing window, then	
	use the regression functions to graph the line or curve of best fit.	
Evaluation	Multiple Choice Test, graph identification with domain and range quiz	

Limits and Their Properties		
Text	Topic	Days
Activity	Handout - Secants and Tangents (self made)	1
	This assignment has students use secant lines to estimate the	
	slope of a tangent line. We investigate the problem of finding the	
	slope of the tangent analytically and try to generate some ideas	
	about how we can over come this problem. This gives us reason	
	to begin exploring the limit.	
Supplement	We graphically define limits by exploring several graphs, some continuous,	1
	some with holes, and some with asymptotes, all on the graphing calculator.	
	We build up the concept of limit. The assignment is a section from the	
	Stewart book which has some excellent problems with various graphs.	
Supplement	Evaluating limits analytically, Limits at infinity. The section is from an old	1
	Merrill Advanced Mathematical Concepts text I found in the closet.	
1.3	Evaluating Limits Analytically.	1
1.3	Squeeze Theorem, sin(x) and cos(x) limits, and their proofs.	2
	Though I do not heavily emphasize proof, there are several time I like	
	to challenge students to write a proof.	
1.4	Continuity and One-Sided limits	1
1.5	Infinite Limits	1
Evaluation	Multiple Choice Chapter Test, with several short quizzes throughout	

Differentiation		
Text	Topic	Days
2.1	The Derivative and the Tangent Line problem.	3
	We revisit the Handout that introduced Chapter 1 and "develop" the	
	precise definition of the derivative	
Activity	Handout with the graphs of several elementary functions. Working in	2
	groups of 2, students must sketch the derivative by estimating slopes of	
	tangents. Students begin to see the relationship between the increasing	
	order of polynomials and their derivatives.	
2.2	Basic Differentiation Rules and Rates of Change	2
	Study the relationship between position, velocity, and acceleration	1
	More problems using the Thomas book	2
2.3	Product and Quotient Rules	3
	More problems using the Stewart book	
Evaluation	Mid-Chapter test - written response questions	
2.4	Chain Rule - 3 days, the third day consisting of all word problems	3
2.5	Implicit Differentiation	2
2.6	Related Rates	3
Evaluation	Multiple Choice test on entire Chapter 2, Related Rates quiz	

Applications of Differentiation

Text	Topic	Days
3.1	Extrema on an Interval	1
3.2	Rolle's Theorem and the Mean Value Theorem	2
3.3	Increasing and Decreasing Functions and the First Derivative Test	2
3.4	Concavity and the Second Derivative Test	4
	One day of all word problems, one of all graphing	
3.5	Limits at Infinity	1
3.6	A Summary of Curve Sketching	2
Evaluation	Written response test, Mid-Chapter	
3.7	Optimization Problems	2
3.8	Newton's Method - writing programs for the graphing calculator	2
3.9	Differentials	2
	Propagated error, tangent approximations	
Evaluation	Multiple Choice test - Chapter 3, Optimization Quiz	

Semester 1 Exam

Integration

Text	Topic	Days
Activity	Handout (self made) - Working in groups of 2, students must create slope	2
	fields for various elementary functions. Students will start to picture	
	the inverse relationship with the derivative.	
4.1	Antiderivatives and Indefinite Integration	2
4.2	Area- Summation formulas	1
	Upper and Lower Limits	2
	Midpoint Limits	1
4.3	Riemann Sums and Definite Integrals	2
4.4	The Fundamental Theorem of Calculus	
	First Fundamental Theorem	2
	Mean Value Theorem, Averaging and Accumulating Functions	1
	Second Fundamental Theorem	1
Evaluation	Mid Chapter Test - written response questions	
4.5	Integration by Substitution	3
4.6	Numerical Integration	
	Trapezoidal Rule	1
	Calculator programming - Trapezoidal rule, Simpson's rule,	2
	and the Midpoint rule	
Evaluation	Multiple Choice Test	

Logarithmic, Exponential, and Other Transcendental Functions

Text	Topic	Days
5.1	The Natural Logarithm Function: Differentiation	1
5.2	The Natural Logarithm Function: Integration	2
5.3	Inverse Functions	1
5.4	Exponential Functions: Derivatives and Integrals	2
5.5	Bases Other Than e and Applications - 1 full day on applications	2
Evaluation	Mid Chapter Test - written response	
5.6	Differential Equations - Growth and Decay	2
5.7	Differential Equations - Separation of Variables	1
5.8	Inverse Trigonometric Functions: Differentiation	2
5.9	Inverse Trigonometric Functions: Integration	2
Evaluation	Multiple Choice Test	

	Applications of Integration								
Text	Topic								Days
6.1	Area of a Region Between Two Curves								1
6.2	Volume: The Disk Method								4
	Includes volumes with geometric cross-sections								
6.3	Volume: The Shell Method								3
6.4	Arc Length and Surfaces of Revolution								3
Evaluation	Quiz - Written response questions								
	AP Test								
	Other Topics								
	To be chosen from:								
	Limit Proofs								
	Review of Conic Sections								
	Programming on the Graphing Calculator								
	Other ???								