

AP Calculus – AB

Class meets odd days for 75 mins and even days for 35 mins.

Syllabus

Primary Text:

Hughes-Hallett, Deborah, and Andrew M. Gleason, et. al. *Calculus* 3d ed. New York: John Wiley & Sons, 2004

Supplementary Text:

Finney, Ross L. and George B. Thomas et. al. *Calculus- Graphical, Numerical, Algebraic*. Reading, MA: Addison-Wesley, 1995

Graphing Calculator Required

Recommended Calculator: TI- 83 or TI-83+ We use graphing calculators on a daily basis. All students have calculator access at home as well as in class.

My approach to teaching calculus is to approach all problems from multiple perspectives: graphical, numerical, algebraic, and analytical. This helps to ensure that students have a good foundation in the fundamentals of calculus. I model early the proper way to answer questions and fully justify solution in class. I require the same of my students- either verbally or through written work. Being able to communicate mathematically is an important skill for all students.

AP Practice home works are a combination of free-response and multiple choice questions. Students are expected to formally write up all solutions and clearly justify all answers. The free-response questions are graded according to the AP scoring rubric so they can get an accurate picture of what they can and can not get credit for.

Final Exam: Their final exam is the 2003 multiple choice questions and the most current released items for free response.

(FT = Finney Thomas Book)

Section Title AP Skills Teaching Techniques Assessments

Section	Title	AP Skills	Teaching Techniques	Assessments
Unit 1	Functions & Change	Pre-Calculus skills that were assigned through summer work are reviewed briefly.	Over the summer, students are given problems from this unit to do. The time we spend in class is just to hit the highlights and to go over problems from the summer work.	Daily HW
5 Days	Exponential Functions			Quizzes
	New Functions from Old			Unit Test
	Logarithmic Functions			
	Trigonometric Functions			
	Powers, Polynomials, & Rational Functions			
Unit 2	Limits (FT)		We approach limits from an analytical & graphical approach. Students need to understand when does a limit exist and be able to communicate it clearly to their audience.	Daily HW
5 Days	Continuity (FT)			Quizzes
	Limits Involving Infinity (FT)			Unit Test

Unit 3	How do we measure speed?	<ul style="list-style-type: none"> • Definition of derivative- instantaneous rate of change • Connection between graphs of a function and it's derivative. <ul style="list-style-type: none"> ◦ increasing/decreasing behavior & concavity • Find the equation of a tangent line. • Not all functions have derivatives: <ul style="list-style-type: none"> • not locally linear or discontinuous • Intermediate Value Theorem 	<p>We explore derivatives from a graphical view first using the numerical derivative feature on the calculator. We then explore them algebraically and then confirm them graphically.</p>	Daily HW
7 Days	The derivative at a point			Quizzes
	The derivative function			Unit Test
	Interpretations of the derivative			
	The second derivative			
	Continuity and Differentiability			
Unit 4	Powers & Polynomials	<ul style="list-style-type: none"> • Methods of derivatives by hand & using calculator to find the derivative at a point. • Use calculator to sketch a function and it's derivative to reinforce connections between. • Derivatives of trig, ln, e^x. • Finding horizontal and vertical tangents. (algebraically and graphically) • Methods of implicit differentiation • Approximate the value of a function using a tangent line approximation • Mean Value Theorem 	<p>We use the "ball drop" program using the TI calculator along with the velocity match in order to understand the relationship between position-velocity-acceleration. We confirm derivatives using two methods (analytical, graphical, algebraically) to make sure that answers make sense.</p>	Daily HW
16 Days	The exponential function			Quizzes
	The Product & Quotient Rules			Unit Test
	Chain Rule			AP Practice HW #1
	The Trig Functions			
	Applications of the Chain Rule			
	Related Rates of Change (FT)			
	Implicit Functions			
	Linear Approximations & The derivative			
	Using Local Linearity to find Limits			
Unit 5	Using First & Second Derivatives	<p>Relative and global extrema. Sketch $f(x)$ using $f'(x)$.</p>	<p>We redo a 'cake-pan' problem (<i>Math Connections</i> book 2b) to connect a problem that they do in geometry with how to maximize volume of a pan.</p>	AP Practice HW #2
5 Days	Optimization			Daily HW
	Optimization & Modeling			Quizzes
				Mid-Term Exam

Unit 6	How do we measure Distance Traveled?	Area under a curve	We start using a numerical model (table) and then use the calculator to draw a scatterplot to connect the total distance traveled to area under the curve. I have a program on the calculator to draw left and right rectangular estimates so they can understand the power of choosing a really small Δt . We then explore integration using multiple methods to make sure answers make sense.	Daily HW
15 Days	The Definite Integral	Estimations- right, left, midpoint & trapezoidal.		Quizzes
	Interpretations of the Definite Integral	Average value		Unit Test
	Theorems about Definite Integrals	Integration using power rule & trig functions		
	Constructing Antiderivatives Numerically	Difference between definite & indefinite integration		
	Constructing Antiderivatives Analytically	Initial Value problems & motion problems		AP Practice HW #3
	Differential Equations			
	Second Fundamental Theorem of Calculus			
	The Equations of Motion			
Unit 7	Integration by Substitution	Integration using u -substitution		I use various computer programs to simulate the region being revolved around an axis so that students can understand what the solid looks like.
12 Days	Approximating Definite Integrals	Area between curves	Quizzes	
	Area Between Curves	Volume of solids using disks, washers, shells & cross-sections	Unit Test	
	Area & Volume		AP Practice HW # 4 & 5	
	Cylindrical Shells		Quiz/Test	
Unit 8	What is a Differential Equation?	Initial Value problems part 2	Students have a slope field program on their calculator so that they can verify all slope fields.	Daily HW
11 Days	Slope Fields	Creating a slope field- by hand and calculator		Quizzes
	Separation of Variables	Sketching a solution curve by hand and calculator		Unit Test
		Separation of Variables		
				Final Exam – 2003 Multiple Choice 2006 Free Response