Calculus- Honors

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.

(FT = Finney Thomas Book)

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?	▪ Definition of derivative- instantaneous rate of change ▪ Connection between graphs of a function and it's derivative.	We explore derivatives from a graphical view first using the numerical derivative feature on the calculator. We then explore	Daily HW
7 Days	The derivative at a point			Quizzes
	The derivative function			Unit Test
	Interpretations of the derivative			

	The second derivative	o increasing/decreasing behavior & concavity ▪ Find the equation of a tangent line. ▪ Not all functions have derivatives: ▪ not locally linear or discontinuous ▪ Intermediate Value Theorem	them algebraically and then confirm them graphically.	
	Continuity and Differentiability			
Unit 4	Powers & Polynomials	▪ 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	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.	Daily HW
16 Days	The exponential function			Quizzes
	The Product & Quotient Rules			Unit Test
	Chain Rule			
	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	Relative and global extrema. Sketch *f(x)* using *f'(x).*	We redo a 'cake-pan' problem (*Math Connections* book 2b) to connect a problem that they do in geometry with how to maximize volume of a pan.	
5 Days	Optimization			Daily HW
	Optimization & Modeling			Quizzes
				Mid-Term Exam
Unit 6	How do we measure Distance Traveled?	Area under a curve Estimations- right, left, midpoint & trapezoidal. Average value Integration using power rule & trig functions	We start using a numerical model (table) and then use the calculator to draw a scatterplot to connect the total distance	Daily HW
15 Days	The Definite Integral			Quizzes
	Interpretations of the Definite Integral			Unit Test

	Theorems about Definite Integrals	Difference between definite & indefinite integration Initial Value problems & motion problems	traveled to area under the curve. I have a progam 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.	
	Constructing Antiderivatives Numerically			
	Constructing Antiderivatives Analytically			
	Differential Equations			
	Second Fundamental Theorem of Calculus			
	The Equations of Motion			
Unit 7	Integration by Substitution	Integration using *u*-substitution Area between curves Volume of solids using disks, washers, shells & cross-sections	I use various computer programs to simulate the region being revolved around and axis so that students can understand what the solid looks like.	Daily HW
12 Days	Approximating Definite Integrals			Quizzes
	Area Between Curves			Unit Test
	Area & Volume			
	Cylindrical Shells			
				Quiz/Test
Unit 8	What is a Differential Equation?	Initial Value problems part 2 Creating a slope field- by hand and calculator Sketching a solution curve by hand and calculator Separation of Variables	Students have a slope field program on their calculator so that they can verify all slope fields.	Daily HW
11 Days	Slope Fields			Quizzes
	Separation of Variables			Unit Test