

DEPARTMENT: MATHEMATICS	COURSE TITLE: A.P. CALCULUS B.C. COURSE NUMBER: 342
GRADE(S): 9-12	PRE-REQUISITES (IF ANY): PRECALCULUS HONORS ; TRIGONOMETRY & ANALYSIS

UNIT	LENGTH	CONTENT	SKILLS	METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)
Limits and Continuity	2 weeks	<ul style="list-style-type: none"> Limits Continuous functions Asymptotes End behavior Curve sketching 	<ul style="list-style-type: none"> Calculate limits algebraically, numerically, and graphically Apply properties of limits correctly Apply the formal definition of LIMIT correctly Determine whether a function is continuous, identify types of discontinuities, and remove them if possible Identify horizontal and vertical asymptotes and end behaviors of functions Sketch graphs of functions based on understanding of limits, asymptotes and end behaviors 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Derivatives I	2 weeks	<ul style="list-style-type: none"> Slope, tangent line and the concept of derivative Numerical derivatives Derivative rules Derivatives involving polynomials 	<ul style="list-style-type: none"> Explain the concept of derivative of a function graphically, numerically, and using limits Match graphs of functions with graphs of derivative functions Derive the power, product, and quotient rules and apply them to expressions involving polynomials 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Derivatives II	2 weeks	<ul style="list-style-type: none"> Derivatives of functions involving fractional powers and of trigonometric functions Chain rule Implicit differentiation Linear approximation Differentials 	<ul style="list-style-type: none"> Derive and apply the rules for derivatives of trig functions Apply the chain rule correctly Use implicit differentiation to find a derivative expression or its value at a 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	

			<ul style="list-style-type: none"> point. Find the linearization of a function at a given point. Use differentials to estimate the relative change in the value of a function 		
Curve Sketching	2 weeks	<ul style="list-style-type: none"> Critical points First and second derivative tests Rational and radical functions Newton's method 	<ul style="list-style-type: none"> Use first and second derivatives to find critical points, intervals of increase/decrease, inflection points, and concavity of graphs of polynomial, trigonometric, rational, and radical functions Use Newton's method to estimate roots of a function 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Applications of the derivative	1-1 ½ weeks	<ul style="list-style-type: none"> Selections from physics, chemistry, industry, economics, medicine and life experiences 	<ul style="list-style-type: none"> Use derivatives to solve real world problems based on rates of change and optimization 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Antiderivatives	1 week	<ul style="list-style-type: none"> Antiderivatives Slope fields Initial value 	<ul style="list-style-type: none"> Match derivative graphs with corresponding antiderivative graphs Draw a slope field for a given differential equation. Find antiderivative functions for derivatives expressed as known trig derivatives or polynomials Solve initial value problems 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Integrals I	1 ½ weeks	<ul style="list-style-type: none"> Area Riemann sum Definite integral 	<ul style="list-style-type: none"> Estimate area under a curve using rectangles 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Integrals II	2 weeks	<ul style="list-style-type: none"> Fundamental Theorem Indefinite integrals Substitution method Numerical methods 	<ul style="list-style-type: none"> Use the Fundamental Theorem to evaluate an integral or to find the derivative of a function defined by an integral Use the substitution method to evaluate an integral Estimate the value of a definite integral using the trapezoidal rule or Simpson's rule 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	

			<ul style="list-style-type: none"> Calculate integrals from data tables using numerical methods 		
Applications of definite integrals	3 weeks	<ul style="list-style-type: none"> Area, volume, arc length, work, fluid forces, and other topics selected by the teacher 	<ul style="list-style-type: none"> Use integrals to find area between curves and area of a surface of rotation Use integrals to find volumes by the methods of disks, washers, cylindrical shells, and slices Use integrals to calculate arc length Use integrals to solve work and fluid force problems as well as selected other real world problems 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Exponential and logarithmic functions	2-2 ½ weeks	<ul style="list-style-type: none"> Derivatives and integrals of exponential and logarithmic functions Logarithmic differentiation Exponential growth and decay 	<ul style="list-style-type: none"> Use rules of exponents and logs to manipulate expressions and solve equations Find derivatives and evaluate integrals of exponential and logarithmic functions Determine when logarithmic differentiation must be used and apply it correctly Solve differential equations which model exponential growth or decay 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Inverse trig functions	1 week	<ul style="list-style-type: none"> Graphs, derivatives, and integrals involving inverse trig functions 	<ul style="list-style-type: none"> Define and graph the six inverse trig functions Find derivatives of and solve integrals involving inverse trig functions Use inverse trig functions to solve real world problems 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	
Methods of Integration	2 weeks	<ul style="list-style-type: none"> Integration by parts Trigonometric substitution Partial fractions Algebraic manipulations General trig manipulations 	<ul style="list-style-type: none"> Solve integrals by the methods of parts, trig substitution, and partial fractions Use algebraic manipulations and trig identities to put integrands into forms whose integrals can be solved by a 	<ul style="list-style-type: none"> Oral presentations Homework Graded Assignments Tests 	

			<p>previously learned method.</p> <ul style="list-style-type: none"> • Use partial fractions to solve separable differential equations • Use partial fractions to solve sigmoid growth problems 		
Improper integrals	1 ½ weeks	<ul style="list-style-type: none"> • L'Hopital's rule • Indeterminate forms • Improper integrals 	<ul style="list-style-type: none"> • Apply L'Hopital's rule correctly to calculate a limit • Manipulate indeterminate forms algebraically to obtain an expression whose limit can be determined • Evaluate improper integrals using limits • Apply the domination or limit comparison tests to determine whether an improper integral converges 	<ul style="list-style-type: none"> • Oral presentations • Homework • Graded Assignments • Tests 	
Infinite series	4 weeks	<ul style="list-style-type: none"> • Types of sequences and series • Tests for convergence • Power series • Taylor and Maclaurin series 	<ul style="list-style-type: none"> • Use correct notation to denote sequences, series, and their terms • Write explicit and recursive formulas for terms of sequences and series • Find limits of sequences • Find sums of geometric series • Use n^{th}-term, ratio, root, integral, comparison, or alternating series tests to determine convergence of an infinite series • Define a power series • Determine whether a given power series converges • Use Taylor's theorem to generate a power series for a given function • Obtain a Maclaurin series for a given function • Manipulate the series for a given function to obtain a series for a related function • Calculate maximum error using alternating series error 	<ul style="list-style-type: none"> • Oral presentations • Homework • Graded Assignments • Tests 	

			theorem or the LaGrange error estimate		
Parametric and polar curves	3 weeks	<ul style="list-style-type: none"> • Graphs • Slope • Arc length • Area • Vectors 	<ul style="list-style-type: none"> • Sketch graphs of curves given in either parametric or polar form • Translate equations from parametric to cartesian form and vice-versa • Translate equations from polar to cartesian form and vice-versa • Find the slope at a point on a parametric or polar curve • Find the length of a parametric or polar curve • Find the area enclosed by parametric or polar curves • Find area of a surface of revolution generated by parametric or polar curves • Describe position, velocity, and acceleration of a particle as components of a vector • Calculate the speed of a particle using magnitude of a vector 	<ul style="list-style-type: none"> • Oral presentations • Homework • Graded Assignments • Tests 	
AP Test Preparation	1 week	<ul style="list-style-type: none"> • Review of course 		<ul style="list-style-type: none"> • Previously released AP exams and other collected test prep materials 	
Special Projects	Time left After AP exams	<ul style="list-style-type: none"> • Topics selected by students from UMAP modules, interview 	<ul style="list-style-type: none"> • Use understanding of calculus ideas to do an in-depth study of one application of calculus to a real world situation • Use understanding of calculus ideas in an Interview of one person who uses calculus in his/her field of work 	<ul style="list-style-type: none"> • Oral presentation • Final paper 	