Curriculum and Pacing Guide – Mr. White
AP Calculus AB
Revised May 2015

Students who successfully complete this course will receive one credit AP Calculus AB and will take the AP Calculus AB Exam.

1 . The concepts of a limit, as the independent variable approaches a particular value, are addressed numerically, analytically, and graphically. This involves developing the ideas of the existence of a limit. The issues are, if the limit exist, what is it, and if it does not, why not? This necessitates the understanding of "broken graph" oscillating, and asymptotic behaviors. Examination of limits, including one sided limits, is done using the various algebra techniques for the types of functions, the properties of limits and special techniques for rational trig related functions. Continuity and the Intermediate Value theorem and their applications are also part of this unit. Areas of application in this unit are finding equations of tangent lines (and normal lines) at a point and beginning motion problems.

Chapter 2: Limits and Continuity

Days	Section	Topic	Concepts	Assignment
2	2.1	Rates of Change and Limits	Average v. Instantaneous Speed, Properties of Limits, One sided v. Two sided Limits, Sandwich Theorem	P66 QR + #1, 3-36 (3's), 37-41, 63-70
2	2.2	Limits Involving Infinity	Horizontal Asymptote, Properties of Limits as x approaches infinity, Vertical Asymptote, End Behavior Model	p75 QR + #3-51 odd, 59-64
2	2.3	Continuity	Continuity at a Point, Properties of Continuous Functions, Composition of Continuous Functions, Discontinuities, Intermediate Value Theorem, Jump Discontinuity	p84 QR + #2-30 even, 31, 32, 54-59
3	2.4	Rates of Change and Tangent Lines	Average Rate of Change, Slope of a Curve at a Point, Tangent Line, Normal to a Curve,	p92 QR + #1-31 odd, 35-40
3		Review and Quiz		
1		Test	~ Complete Sept 12, 2014	
14	Total Days			

2. The derivative is developed in this unit which involves the geometric interpretation of the tangent line at a point, leading to the limit definition of the derivative of a function. The limit definition is used both to find derivatives at a point and to develop the basic differentiation rules. Basic derivative rules are used for first, second, and higher order derivatives and also for implicit derivatives. The derivative is also investigated in the relationship between position, velocity, acceleration and jerk. Inverse functions are addressed with particular attention given to the natural exponential function as the inverse of the natural logarithm function. The derivatives of the natural exponential function and the natural log function are given. Logarithmic and exponential functions of any base are also investigated along with their corresponding derivatives. Various derivative techniques are developed for natural logarithm functions as needed for techniques for rational form functions, including trigonometric functions.

Chapter 3: Derivatives

Days	Section	Topic	Concepts	Assignment
3	3.1	Derivative of a Function	Derivative, Derivative at a Point, Notation, Relationship between the Graphs of F and F Prime, One-Sided Derivatives	p. 105 QR+ #1-16, 17-25 odd, 36-42
2	3.2	Differentiability	Non-Differentiability, Local Linearity	p114 QR + #1-10, 11-25 odd, 31-37 odd, 40-45
3	3.3	Rules for Differentiation	Differentiation Rules, Higher Order Derivatives	P123 QR + #1-33 odd, 37, 48, 53-58
3	3.4	Velocity and Other Rates of Change	Instantaneous Rates of Change, Instantaneous Velocity, Speed, Acceleration, Linear Motion, Free-Fall Motion	P135 QR + #1,2,4,8,9,10,13-16,18,21,25,27-29,40-46
3	3.5	Derivatives of Trigonometric Functions	Derivative of Trig Functions, Jerk,	p146 QR + #1-10, 12-22 even, 27,29,31,44-49
1		Review		
1		Mid-Chapter Test		
3	3.6	Chain Rule	Derivative of Composite Functions, Chain Rule, Finding dy/dx Parametrically (Skip Derivatives of Parametric Defined Functions)	p153 QR + #3-39 (3's), 70-75
3	3.7	Implicit Differentiation	Implicit Function, Implicit Differentiation, Power Rule for Rational Powers	P162 QR + #1,2,6,7,10,11,17,20,23,24,29,32,34,49,52,56,59-64
2	3.8	Derivatives of Inverse	Inverse, Derivatives of Inverse Trigonometric	P170 QR + #1-10, 14,15,28,35-40

		Trigonometric Functions	Functions	
3	3.9	Derivatives of Exponential and Logarithmic Functions	Derivative of Exponential Functions base e and base a, Derivative of Log Functions base e and base a	P178 QR + #3-30 (3's), 33-35, 40-41, 51,53,57-62
1	Review			
1	Test		~ October 21, 2014	(End of 1st 9 weeks)
29	Total			

3. This unit continues the study of derivatives by investigating their applications. Also three principle theorems are developed and used – the Extreme Value Theorem, Rolle's Theorem, and the Mean Value Theorem. First and second derivatives are used to determine for a given function the critical values, intervals of increase and decrease, relative maxima and minima, points of inflection, and concavity intervals. This application is done with and without graphing calculators. Included with this application is the examination of the relationships of the graphs of a function, the graph of its 1st derivative, and the graph of its 2nd derivative and their relationship through the use of tables. The very useful and important derivative application of solving optimization problems, as well as linear approximations, differentials, and related rates are also investigated in this unit.

Chapter 4: Applications of Derivatives

Days	Section	Topic	Concepts	Assignments
5	4.1	Application of Derivatives	Absolute Extrema, Local Extreme Values, Critical Point, Extreme Value Theorem,	P193 QR + #1-12, 19-25,40,43,45-50
3	4.2	Mean Value Theorem	Mean Value Theorem, Increasing Decreasing Intervals, Antiderivative, Rolle's Theorem, Monotonic Functions	P202 QR + #1-4,10-12,14-19,23-25,29-37,40,43,51-56
4	4.3	Connecting *f* prime and *f* double prime with the graph of *f*	First Derivative Test, Definition of Concavity, Concavity Intervals, Point of Inflection, Second Derivative Test,	P214 QR+ #1,2,5,8,10,11,14,16,21-24,29,33,36,40-42,45-47,55-60
5	4.4	Modeling and Optimization	Max-Min Problems, Optimization	P226 QR + #1-7,9,11,12,14,16,17,20,22,23,26,31,36,46,51-56
3	4.5	Linearization	Linear Approximation, Differentials, Absolute Relative and Percent Change, (Skip Newton's Method)	P242 QR + #1-3,8,11,13,19-21,26,35,36
6	4.6	Related Rates	Related Rates	P250 QR + 1-3,6,8,11,12,14,15,16,18,20-22,30,32,36-41
2		Review and Quiz		
1		Test	~Dec 16, 2014	
29	Total			

4. The definite integral is developed by first examining estimates of the areas of plane regions as sums of rectangles constructed by using a partitioning of an interval and the right, left, midpoint or any point of the partition. The definition of a definite integral is then given as a limit of an infinite Riemann Sum, the exact area of the plane region. The Fundamental Theorem of Calculus is developed along with the Mean Value Theorem for Integrals and the Average Value of a function on an interval. The Second Fundamental Theorem is also given. The main applications here are areas of simple plane regions by approximation, including the analysis of whether the approximation is an over or under estimate. This unit also includes estimation of plane regions by trapezoidal approximation.

Chapter 5: The Definite Integral

Days	Section	Topic	Concepts	Assignments
2	5.1	Estimating with Finite Sums	Distance Traveled, Rectangular Approximation Method	QR + #1-7, 9, 10, 15, 18, 23, 24, 31-36
2	5.2	Riemann Sums	Definite Integral, Integrability,	QR + #7-9, 13-24, 29,30, 33-36, 41-56
3	5.3	Definite Integrals and Antiderivatives	Integral Properties, Average Value, Mean Value Theorem for Integrals	QR + #1-6, 11, 12, 15-26, 31-34, 45-50
3	5.4	Fundamental Theorem of Calculus	Fundamental Theorem of Calculus Part 1 and 2, Connection to Area	QR + #1-22, 27-35, 41-49, 59, 65-70, 73
1	5.5	Trapezoidal Rule	Trapezoid Rule (Skip Other Algorithms, Simpson's Rule and Error Bounds)	QR + #1-4, 8-11, 13, 27, 31-36
1		Review		
1		Test	~Jan 13, 2015	(End of 2nd Nine Weeks
14	Total			

5. This unit introduces slope fields and the solving of differential equations, leading to the concept of an antiderivative. Indefinite integrals are solved through various techniques including u du substitution and pattern recognition. Exponential growth and decay model is developed from integration of separation of variables. The Logistic Growth model is also included.

Chapter 6: Differential Equations and Mathematical Modeling

Days	Section	Topic	Concepts	Assignments
3	6.1	Slope Fields / Diff Eq	Slope Fields, Differential Equations (Skip Euler's Method)	QR + #1-13,18,25-28,30,32,35-40,43,51,53,59-64
5	6.2	Antidifferentiation by Substitution	Properties of Indefinite Integrals, Indefinite Integrals, Leibniz Notation, u du substitution	QR + #1-6, 17-19,22,27,33,34,41,48,53,56,65,73,75,76
0	6.3	Antidifferentiation by Parts	Integral forms whose antiderivatives are inverse trig functions (Skip Antidifferentiation by Parts)	---
3	6.4	Exponential Growth and Decay	Separable Differential Equation, Exponential Change, Continuous and Compound Interest, Modeling Growth and Decay	p357 QR+ #1,2,4,8,9,12,21,22, 24,30,31,40,47,52
1	6.5	Logistic Growth	Logistic Differential Equations, Logistic Curve, Logistic Growth Model (Skip Partial Fractions)	---
2		Review and Quiz		
1		Test	~Feb 10, 2015	
15	Total			

6. This unit involves the interpretation of the integral as an accumulator and applications of finding areas and volumes. The definite integral is used to find the areas of regions between curves using all types of functions. These are areas on an interval, areas between curves including curves with more than two intersections, also incorporating change of axis. The next application is volume beginning with three dimensional shapes of uniform cross sections. Next included are volumes of rotation using the disk, and washer method, also incorporating the change of axis.

Chapter 7: Applications of Definite Integrals

Days	Section	Topic	Concepts	Assignments
4	7.1	Integral as Net Change	Displacement, Consumption over time, Net Change from Data	P385 R + #1-4, 9-21, 24, 25, 30-36
5	7.2	Areas in the Planes	Area between Curves, Area Enclosed by Intersecting Curves, Integrating in respect to y, Integration by Geometric Formula	P395 QR+ #1-14, 21-24, 37-38, 43, 50-55
7	7.3	Volume	Cross Sections, Washers (Skip Shells)	P405 QR + #1-4,7-9,12-20evens, 21, 23-24,29,32,39,42,44,49,51,63-68
2		Review and Quiz		
1		Test	~March 24, 2015	(End of 3rd 9 Weeks)
19	Total Days			

Total Instructional days: ~120 (Snow days will affect time line)
The remaining time (~5 weeks) is for AP Test Review consisting of discussion of release multiple choice and free response questions.

AP TEST: Tuesday, May 4th, 2016

V. Major Text:

Taken from:
Finney, Damana, Waits and Kennedy. *Calculus: Graphical, Numerical, Algebraic (AP Edition), 3rd Ed.* Upper Saddle River, New Jersey, 2007
Finney, Damana, Waits and Kennedy. *Calculus: A Complete Course, 2nd Ed.* Upper Saddle River, New Jersey, 2000

VI. Supplementary Materials:

Workbook: "Multiple Choice and Free Response Questions in Preparation for the AP Calculus AB Examination"