SUBJECT: AP Calculus AB	GRADE: 9-12
Unit Title: Unit 2 – Limits and Continuity	**Time Frame: 4 weeks (Summer work)**

UNIT OVERVIEW

- What are limits?
- How are limits of functions evaluated?
- How are limits used to define continuity?
- How are limits used to describe asymptotic and unbounded behavior?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS

COMPETENCIES	LEARNING TARGETS
Limits and Continuity I can determine limits and identify continuity of functions.	**Limit Notation** ● I can use limit notation. (K1MAB12S1) **One-sided Limits** ● I can evaluate one-sided limits and limits involving infinity. (K1MAB12S2) **Limit Existence** ● I can evaluate when limits do not exist. (K1MAB12S3) **Limits of Functions** ● I can determine limits of functions. (K1MAB12S4) **Descriptions using Limits** ● I can use limits to describe asymptotic and unbounded behavior. (K1MAB12S5) **Continuity** ● I can define continuity. (K1MAB12S6)

	Discontinuities ● I can identify types of discontinuities. (K1MAB12S7) **Intermediate Value Theorem** ● I can apply the intermediate value theorem. (K1MAB12S8)

SUBJECT: AP Calculus AB	**GRADE: 9-12**
Unit Title: Unit 3 – Derivatives	**Time Frame: 8 weeks**
UNIT OVERVIEW	
● What is the limit definition of the derivative of a function? ● What does a derivative represent? ● What is the difference between the average rate of change and the instantaneous rate of change of a function? ● When are functions not differentiable? ● What are the rules of differentiation? ● What is implicit differentiation? ● How is differentiation applied to motion? ● How is differentiation used to find higher order derivatives?	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
● Collaboration and Teamwork 9-12: Derivatives Presentation (S1C) ● Critical Thinking and Problem Solving 9-12: Derivatives Presentation (S4C)	
COMPETENCIES	**LEARNING TARGETS**
Derivatives and Integrals	**Derivative as Rate of Change**

I can find, interpret, and use derivatives and integrals to solve problems.	• I can understand the meaning of a derivative as the instantaneous rate of change. (K1MAB13S1) **Limit Definition of Derivative** • I can apply the limit definition of derivative. (K1MAB13S2) **Average Rate of Change** • I can estimate the derivative from graphs and tables using average rate of change. (K1MAB13S3) **Slope of Tangent Line** • I can solve problems involving the slope of the tangent line at a point. (K1MAB13S4) **Differentiability and Continuity** • I can recognize the connection between differentiability and continuity (K1MAB13S5) **Non-differentiability** • I can identify and classify points at which a function is not differentiable. (K1MAB13S6) **Derivative Rules** • I can use derivative rules. (K1MAB13S7) **Product and Quotient Rules** • I can use the product and quotient rules (K1MAB13S8) **Higher Order Derivatives** • I can use differentiation to find higher order derivatives. (K1MAB13S9) **Applications of Derivatives** • I can solve applications of derivatives involving linear motion. (K1MAB13S10) **Trig Derivatives** • I can find derivatives of trigonometric functions. (K1MAB13S11) **Chain and Power Rules** • I can use the chain and power chain rules. (K1MAB13S12) **Implicit Differentiation** • I can find derivatives implicitly. (K1MAB13S13) **Derivative of an Inverse** • I can find derivatives of f inverse at (f(a), a), given (a, f(a)) and f'(a). (K1MAB13S14) **Inverse Trig Derivatives** • I can find derivatives of inverse trigonometric functions. (K1MAB13S15)

	Exp and Log Derivatives ● I can find derivatives of exponential and logarithmic functions. (K1MAB13S16)

SUBJECT: AP Calculus AB	**GRADE: 9-12**
Unit Title: Unit 4 – Applications of Derivatives	**Time Frame: 6 weeks**
UNIT OVERVIEW	
● How is differentiation used to solve related rate problems? ● How are derivatives used to analyze functions? ● How are derivatives used to solve optimization problems?	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
● Collaboration and Teamwork 9-12: Related Rates Presentation (S1C) ● Critical Thinking and Problem Solving 9-12: Related Rates Presentation (S4C)	
COMPETENCIES	**LEARNING TARGETS**
Derivatives and Integrals I can find, interpret, and use derivatives and integrals to solve problems.	**Related Rates** ● I can solve applications of derivatives involving related rates. (K1MAB13S17) **Function Behavior and Extreme Values** ● I can use derivatives to analyze function behavior and find points of extremity. (K1MAB13S18) **Mean Value Theorem**

	• I can apply the mean value theorem to describe the behavior of a function over an interval. (K1MAB13S19) **Concavity and POI** • I can use derivatives to analyze function concavity and points of inflection. (K1MAB13S20) **Optimization** • I can solve applications of derivatives involving optimization. (K1MAB13S21)

SUBJECT: AP Calculus AB	**GRADE: 9-12**
Unit Title: Unit 5 – Integrals	**Time Frame: 6 weeks**
UNIT OVERVIEW	
• What are integrals? • How are integrals evaluated and approximated? • What are antiderivatives and how are they used to evaluate integrals? • What is the Fundamental Theorem of Calculus? • How are derivatives and integrals found using the FTC?	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
COMPETENCIES	**LEARNING TARGETS**
Derivatives and Integrals	**Integral Approximation Methods**

I can find, interpret, and use derivatives and integrals to solve problems.	● I can approximate a definite integral using rectangular and trapezoidal methods. (K1MAB13S22) **Riemann Sums and Definite Integrals** ● I can interpret and express the limit of a Riemann sum as a definite integral using integral notation. (K1MAB13S23) **Definite Integral Evaluation** ● I can calculate a definite integral using geometry and properties of definite integrals. (K1MAB13S24) **Antiderivatives** ● I can recognize antiderivatives of basic functions. (K1MAB13S25) **Fundamental Theorem of Calculus** ● I can find the derivative of a function defined as an integral using the Fundamental Theorem of Calculus. (K1MAB13S26) **Functions defined as Integrals** ● I can analyze functions defined by an integral. (K1MAB13S27) **Evaluating Integrals by the FTC** ● I can evaluate indefinite and definite integrals using antiderivatives and the Fundamental Theorem of Calculus. (K1MAB13S28)

SUBJECT: AP Calculus AB	GRADE: 9-12
Unit Title: Unit 6 – Differential Equations and Methods of Integration	**Time Frame: 4 weeks**

UNIT OVERVIEW

- What are slope fields and how are they used to determine solution graphs?
- How are differentiable equations solved?
- What are antiderivatives and how are they used?
- How are integrals evaluated using u-substitution?
- How is separation used to solve differential equations?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS

COMPETENCIES	LEARNING TARGETS
Derivatives and Integrals I can find, interpret, and use derivatives and integrals to solve problems.	**Solving Differential Equations** ● I can analyze differential equations to obtain general and specific solutions. (K1MAB13S29) **Estimating Solutions of Differential Equations** ● I can verify and estimate solutions of differential equations. (K1MAB13S30) **Slope Fields** ● I can analyze differential equations by identifying characteristics of their slope fields. (K1MAB13S31) **Find Antiderivatives** ● I can find antiderivatives. (K1MAB13S32) **U-Substitution**

	● I can evaluate indefinite and definite integrals using u-substitution (K1MAB13S33) **Separation of Variables** ● I can analyze differential equations to obtain general and specific solutions using separation of variables. (K1MAB13S34) **Exponential Growth** ● I can interpret, create, and solve differential equations from problems in context (specifically exponential growth) (K1MAB13S35)

SUBJECT: AP Calculus AB	**GRADE: 9-12**
Unit Title: Unit 7 – Applications of Integration	**Time Frame: 6 weeks**
UNIT OVERVIEW	
● How are integrals used to evaluate net change? ● How are integrals used to find the average value of a function? ● How are integrals used to calculate areas ● How are integrals used to calculate volumes?	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
● Collaboration and Teamwork 9-12: Applications of Integration Presentation (S1C) ● Critical Thinking and Problem Solving 9-12: Applications of Integration Presentation (S4C)	
COMPETENCIES	**LEARNING TARGETS**
Derivatives and Integrals I can find, interpret, and use derivatives and integrals to solve problems.	**Integrals as Net Change** ● I can interpret a definite integral as net change of a quantity. (K1MAB13S36)

	Linear Motion ● I can apply definite integrals to problems involving linear motion. (K1MAB13S37) **Average Value of a Function** ● I can apply definite integrals to problems involving the average value of a function. (K1MAB13S38) **Area and Volume** ● I can apply definite integrals to problems involving area and volume (K1MAB13S39)

SUBJECT: AP Calculus AB	**GRADE: 9-12**
Unit Title: Unit 8 – L'Hopital's Rule and AP Exam Preparation	**Time Frame: 4 week**
UNIT OVERVIEW	
● How are limits of indeterminate forms evaluated? ● How are MC and FR questions answered on AP Exam format assessments?	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
● Resilience and Grit 9-12: AP Calculus AB Simulation Exam (D4C)	
COMPETENCIES	**LEARNING TARGETS**
Limits and Continuity I can determine limits and identify continuity of functions.	**L'Hopital's Rule** ● I can find limits of indeterminate forms using L'Hopital's Rule. (K1MAB12S9)