SUBJECT: AP Calculus BC	GRADE: 9-12
Unit 6: Differential Equations and Methods of Integration	**Time Frame: 6 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 Euler's Method used?
- How are integrals of products evaluated using Integration by Parts?
- How is separation used to solve differential equations?
- How are exponential differential equations solved and applied?
- How are integrals of quotients evaluated using Partial Fraction Decomposition?
- How are logistic differential equations solved and applied?

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. (K1MAB13T29) **Estimating Solutions of Differential Equations** ● I can verify and estimate solutions of differential equations. (K1MAB13T30) **Slope Fields**

	● I can analyze differential equations by identifying characteristics of their slope fields. (K1MAB13T31) **Find Antiderivatives** ● I can find antiderivatives. (K1MAB13T32) **U-Substitution** ● I can evaluate indefinite and definite integrals using u-substitution (K1MAB13T33) **Euler's Method** ● I can use Euler's Method. (K1MAB13T34) **Integration by Parts** ● I can evaluate integrals using integration by parts and partial fraction decomposition. (K1MAB13T41) **Separation of Variables** ● I can analyze differential equations to obtain general and specific solutions using separation of variables. (K1MAB13T34) **Exponential Growth** ● I can interpret, create, and solve differential equations from problems in context (specifically exponential growth) (K1MAB13T35) **Partial Fraction Decomposition** ● I can analyze differential equations to obtain general and specific solutions involving logistic growth. (K1MAB13T42) **Logistic Growth** ● I can interpret, create, and solve differential equations from problems in context (specifically logistic growth). (K1MAB13T43)

SUBJECT: AP Calculus BC	GRADE: 9-12
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?
- How are lengths of curves calculated?

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. (K1MAB13T36) **Linear Motion** • I can apply definite integrals to problems involving linear motion. (K1MAB13T37) **Average Value of a Function** • I can apply definite integrals to problems involving average value of a function. (K1MAB13T38) **Area and Volume** • I can apply definite integrals to problems involving area and volume. (K1MAB13T39) **Lengths of Curves**

	• I can apply definite integrals to problems involving length of curves. (K1MAB13T44)

SUBJECT: AP Calculus BC	**GRADE: 9-12**
Unit 8: L'Hopital's Rule and AP Exam Preparation	**Time Frame: 4 week**
UNIT OVERVIEW	
• How are limits of indeterminant forms evaluated? • How are function growth rates compared? • How are improper integrals evaluated?	
LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
• Collaboration and Teamwork 9-12: Improper Integrals Presentation (S1C) • Critical Thinking and Problem Solving 9-12: Improper Integrals Presentation (S4C)	
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. (K1MAB12T9) **Function Growth Rates** • I can use limits to compare function rates of change. (K1MAB12T10)
Derivatives and Integrals I can find, interpret, and use derivatives and integrals to solve problems.	**Improper Integral** • I can evaluate an improper integral or show that it diverges. (K1MAB13T45)

SUBJECT: AP Calculus BC	GRADE: 10-12
Unit 9: Infinite Series	**Time Frame: 12 weeks**

UNIT OVERVIEW

- How are arithmetic and geometric sequences different and used?
- How is sequence divergence and convergence determined?
- What are series and how is the sum evaluated?
- How is series convergence and divergence determined?
- How are power series created and used?
- How are Taylor Polynomials and Taylor Series generated?
- What are the Maclaurin series?
- How are error bounds determined?
- What are the tests for convergence?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
● Collaboration and Teamwork 9-12: Series Convergence Presentation (S1C) ● Critical Thinking and Problem Solving 9-12: Series Convergence Presentation (S4C)	

COMPETENCIES	LEARNING TARGETS
Sequences and Series I can identify, describe, and represent various types of sequences and series.	**Sequences** ● I can distinguish between arithmetic and geometric sequences. (K1MAB14T1) **Rules for Sequences** ● I can write explicit and recursive rules for the nth term of arithmetic and geometric sequences. (K1MAB14T2) **Sequence Convergence/Divergence**

	● I can determine whether a sequence converges or diverges. (K1MAB14T3) **Series Convergence/Divergence** ● I can determine whether a series converges or diverges. (K1MAB14T4) **Sum of a Series** ● I can determine or estimate the sum of a series. (K1MAB14T5) **Algebraic Power Series Creation** ● I can create a power series by algebraic processes, substitution, and properties of geometric series. (K1MAB14T6) **Calculus Power Series Creation** ● I can create a power series by operations on known series such as term-by-term differentiation or integration. (K1MAB14T7) **Taylor Series** ● I can write a power series representing a given function using Maclaurin and Taylor series. (K1MAB14T8) **Taylor Polynomials** ● I can construct and use Taylor polynomials. (K1MAB14T9) **Maclaurin Series** ● I can recognize and use geometric series, Maclaurin series for sinx, cosx, and e^x. (K1MAB14T10) **Lagrange Error Bound** ● I can bound the error of a Taylor polynomial using a Lagrange error bound or an alternating series error bound. (K1MAB14T11) **Ratio Test** ● I can determine the radius and interval of convergence of a power series using the ratio test. (K1MAB14T12) **Alternating Series Error Bound** ● I can bound the error of a Taylor polynomial using an alternating series error bound. (K1MAB14T13)

SUBJECT: AP Calculus BC	GRADE: 10-12
Unit 10: Parametric, Vector, and Polar Functions	**Time Frame: 6 weeks**

UNIT OVERVIEW

- How are parametric, vector, and polar functions differentiated?
- How is vector differentiation applied to planar motion?
- How is vector integration applied to planar motion?
- How is polar integration applied to find areas between polar curves?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
● Collaboration and Teamwork 9-12: AP Calculus AB MC random group boardwork practice (D4C) ● Critical Thinking and Problem Solving 9-12: AP Calculus AB FRQs (S4C) ● Resilience and Grit 9-12: AP Calculus AB Sim Exam (D4C)	

COMPETENCIES	LEARNING TARGETS
Derivatives and Integrals I can find, interpret, and use derivatives and integrals to solve problems.	**Parametric, Vector, and Polar Functions** ● I can find derivatives of vector-valued functions, polar functions, and parametric functions. (K1MAB13T46) **Vector Differentiation** ● I can solve applications of derivatives involving planar motion. (K1MAB13T47) **Vector Integration** ● I can apply definite integrals to problems involving planar motion represented by parametric or vector-valued functions. (K1MAB13T48) **Polar Area** ● I can apply definite integrals to problems involving the area between polar curves. (K1MAB13T49)