Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Limits**

Time Allotment: 1 week **Unit Sequence: 1**

Major Concepts to be learned:

- The limit.

Expected Skills to be demonstrated:

- Evaluate limits graphically and algebraically.
- Define continuity and use that definition to determine whether or not a function is continuous at a point or on an interval.
- Classify types of discontinuities.

PA Standards/Anchors:

CC.2.2.HS.D.4	CC.2.2.HS.D.7
CC.2.2.HS.D.5	CC.2.2.HS.C.1
CC.2.2.HS.D.6	CC.2.2.HS.C.2

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Derivatives**

Time Allotment: 2 weeks **Unit Sequence: 2**

Major Concepts to be learned:

- The derivative.

Expected Skills to be demonstrated:

- Define the derivative and interpret it graphically and physically.
- Evaluate derivatives numerically, using either definition, or using the power, product, quotient or chain rules.
- Perform implicit differentiation.

PA Standards/Anchors:

CC.2.1.HS.F.1 CC.2.2.HS.C.1
CC.2.2.HS.D.1 CC.2.2.HS.C.2
CC.2.2.HS.D.2

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Derivative Applications**

Time Allotment: 2 weeks **Unit Sequence: 3**

Major Concepts to be learned:

- Critical points.
- Extrema.
- The Mean Value Theorem.

Expected Skills to be demonstrated:

- Find local and global extrema on an interval.
- Write a function describing the relationship between two variables using secondary relationships as necessary.
- Apply the first and second derivatives to curve sketching.
- Solve related rates problems.
- Solve problems involving the Mean Value Theorem/Rolle's Theorem.

PA Standards/Anchors:

CC.2.1.HS.F.3	CC.2.2.HS.D.8	CC.2.2.HS.C.2
CC.2.1.HS.F.4	CC.2.2.HS.D.10	CC.2.2.HS.C.3
CC.2.2.HS.D.7	CC.2.2.HS.C.1	CC.2.2.HS.C.6

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12

Course Title: AP Calculus BC

Topic/Concept: Parametric & Polar Functions

Time Allotment: 4 weeks

Unit Sequence: 4

Major Concepts to be learned:

- Parametric functions.
- Polar coordinates.

Expected Skills to be demonstrated:

- Apply the parametric chain rule.
- Find the length of a curve given parametrically.
- Solve motion problems involving vector-valued functions.
- Find points of intersection given two polar functions.
- Find the area bounded by polar functions.
- Find slope at a point on the graph of a polar function.

PA Standards/Anchors:

CC.2.2.HS.D.7	CC.2.2.HS.C.1	CC.2.3.HS.A.9
CC.2.2.HS.D.8	CC.2.2.HS.C.2	
CC.2.2.HS.D.10	CC.2.2.HS.C.7	

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Integration**

Time Allotment: 2 weeks **Unit Sequence: 5**

Major Concepts to be learned:

- The indefinite integral.
- The definite integral.
- The Fundamental Theorem of Calculus.

Expected Skills to be demonstrated:

- Find an antiderivative.
- Define the definite integral.
- Evaluate definite integrals numerically and using the Fundamental Theorem.
- Find the average value of a function.

PA Standards/Anchors:

CC.2.1.HS.F.1 CC.2.2.HS.C.1
CC.2.2.HS.D.1 CC.2.2.HS.C.2
CC.2.2.HS.D.2

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Integration Applications**

Time Allotment: 1 week **Unit Sequence: 6**

Major Concepts to be learned:

- Defining differential elements.

Expected Skills to be demonstrated:

- Calculate the area between two curves.
- Calculate the volume for a solid of revolution using both disc and shell methods, and the volume of a solid which can be broken into plane slices of similar geometry
- Calculate the length of a curve.

PA Standards/Anchors:

CC.2.1.HS.F.3	CC.2.2.HS.D.8	CC.2.2.HS.C.2
CC.2.1.HS.F.4	CC.2.2.HS.D.10	CC.2.3.HS.A.12
CC.2.2.HS.D.7	CC.2.2.HS.C.1	

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 | **Course Title: AP Calculus BC** | **Topic/Concept: Calculus of Trigonometric Functions**

Time Allotment: 1 week | **Unit Sequence: 7**

Major Concepts to be learned:

- Application of techniques of differention to find derivatives of trig functions.

Expected Skills to be demonstrated:

- Differentiate trig and inverse trig functions.
- Antidifferentiate using trig differentiation formulas and u-substitution.

PA Standards/Anchors:

CC.2.2.HS.D.2	CC.2.2.HS.C.4	CC.2.3.HS.A.9
CC.2.2.HS.D.8	CC.2.2.HS.C.7	
CC.2.2.HS.C.1	CC.2.2.HS.C.8	

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 | **Course Title: AP Calculus BC** | **Topic/Concept: Calculus of Exponential and Logarithmic Functions**

Time Allotment: 2 weeks | **Unit Sequence: 8**

Major Concepts to be learned:

- Second Fundamental Theorem of Calculus.
- L'Hospital's Rule.

Expected Skills to be demonstrated:

- Differentiate logarithmic functions of any base.
- Integrate functions of the form 1/x.
- Differentiate and integrate exponential functions of any base.
- Apply the "Second" Fundamental Theorem of Calculus.
- Differentiate logarithmically.
- Use L'Hospital's Rule to evaluate limits.

PA Standards/Anchors:

CC.2.1.HS.F.1
CC.2.2.HS.D.2
CC.2.2.HS.D.8
CC.2.2.HS.C.1
CC.2.2.HS.C.5

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Differential Equations**

Time Allotment: 2 weeks **Unit Sequence: 9**

Major Concepts to be learned:

- Differential equation.
- Slope Field.
- Euler's Method.

Expected Skills to be demonstrated:

- Find general and particular solutions for differential equations which can be solved using separation of variables.
- Write a differential equation which models a physical scenario.
- Sketch a slope field defined by a differential equation
- Sketch the particular solution to a differential equation on a slope field
- Approximate the solution to a differential equation using Euler's method.

PA Standards/Anchors:

CC.2.1.HS.F.3	CC.2.2.HS.D.8	CC.2.2.HS.C.3
CC.2.1.HS.F.4	CC.2.2.HS.C.1	CC.2.2.HS.C.5
CC.2.2.HS.D.8	CC.2.2.HS.C.2	CC.2.2.HS.C.6

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Techniques of Integration**

Time Allotment: 2 weeks **Unit Sequence: 10**

Major Concepts to be learned:

- Integration by parts.
- Integration by partial fractions.
- Improper integrals.
- Logistic differential equations.

Expected Skills to be demonstrated:

- Integrate using integration by parts and by partial fractions.
- Evaluate improper integrals.
- Recognize and solve logistic differential equations and describe the characteristics of their solutions.

PA Standards/Anchors:

CC.2.2.HS.D.1	CC.2.2.HS.D.4	CC.2.2.HS.D.8
CC.2.2.HS.D.2	CC.2.2.HS.D.5	CC.2.2.HS.D.10
CC.2.2.HS.D.3	CC.2.2.HS.D.6	CC.2.2.HS.C.1

Eligible Content:

N/A

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 12 **Course Title: AP Calculus BC** **Topic/Concept: Taylor Series**

Topic Time Allotment: 9 weeks **Unit Sequence: 11**

Major Concepts to be learned:

- Taylor series.
- Convergence of a series.
- Power series.

Expected Skills to be demonstrated:

- Use a variety of tests to determine whether a series converges or diverges.
- Find the sum of a geometric series.
- Find the interval of convergence for a power series and it derivatives and antiderivatives.
- Express a function as a Taylor series and find its interval of convergence.
- Approximate a function using a Taylor polynomial and put an upper bound on its remainder (error).

PA Standards/Anchors:	Eligible Content:
CC.2.2.HS.D.6 CC.2.2.HS.C.1	N/A

Instructional Strategies:	Assessments:
• Problem solving activities • Lecture • Note Taking	• Test