Honors Calculus and AP Calculus Scope & Sequence
Honors Calculus and Calculus AB study Units 1-7
Calculus BC studies units 8-11

Days May Vary	Unit	Outcomes	Essential/Guiding Questions
7-10	Unit 1: Limits and Continuity	- Understand what Calculus is and how it compares with Precalculus. - Understand that the tangent line problem and the area problem are basic to Calculus. - Estimate a limit using a numerical and or a graphical approach. - Evaluate a limit using a variety of strategies. - Develop and use a strategy for finding limits. - Analyze and use properties of continuity. - Analyze, understand and use the Intermediate Value Theorem. - Determine infinite limits from the left and the right.	- How does Calculus comment to what you learned in Precalculus? - How do you evaluate limits and why do you need to? - What is the best way to develop a strategy for finding limits? - What is the value of the Intermediate Value Theorem? - How do you determine infinite limits?
7-10	Unit 2: The Derivative	Determine the relationship between differentiability and	What is the relationship between differentiability

		continuity. • Determine the derivative of a function using a variety of rules. • Use derivatives to find the rate of change. • Analyze the derivative of a trigonometric function and a higher-order derivative of a function. • Analyze and use the Chain Rule and the General Power Rules to find the derivatives of various functions. • Distinguish between functions written in implicit form and explicit form. • Analyze and use implicit differentiation to find the derivative of a function. • Analyze and use related rates to solve real-world problems.	and continuity? • How do you find the derivative of a function? • How do you find the derivative of a trigonometric function and a higher-order derivative of a function? • How do the Chain Rule and the General Power Rule differ? • How do you distinguish between functions written in implicit form and those written in explicit form? • How is implicit differentiation used to find the derivative of a function?
7-10	Unit 3: Applications of the Derivative	• Determine the extrema of an interval. • Differentiate between Rolle's Theorem and the Mean Value Theorem. • Distinguish between the intervals of functions that are increasing and decreasing. • Apply the Second Derivative	• How do you find the extrema of an interval? • How do you determine if the interval of a function is increasing or decreasing? • What is the relationship between the Second Derivative Test and concavity?

		Test to find the extrema of a function. • Determine finite and infinite limits at infinity. • Analyze and sketch the graph of a function. • Solve applied minimum and maximum problems. • Estimate a propagated error using a differential • Find and analyze the differential of a function using differentiation formulas. • Apply L'Hopital's Rule to evaluate a limit.	• How do you determine the finite and infinite limits at infinity? • What are the applications of minimum and maximum problems? • How do you estimate a propagated error? • How do you evaluate a limit?
7-10	Unit 4: The Integral	• Determine the general solutions for a differential equation and use the indefinite integral notation for antiderivatives. • Use sigma notation to write and evaluate a sum. • Approximate the area of a plane region and determine the area using limits. • Evaluate a definite integral using limits and using properties of definite integrals. • Evaluate a definite integral using the Fundamental	• How do you determine solutions for a differential equation? • When is it better to estimate the area of a plane region? • How do you evaluate a definite integral? • How do you evaluate an indefinite integral? • How do you approximate a definite integral?

		Theorem of Calculus. • Explain the use of each: the Mean Value Theorem for Integrals, the Second Fundamental Theorem of Calculus and the Net Change Theorem. • Examine the ways to find an indefinite integral. • Analyze the approximate errors in the Trapezoidal Rule and the Simpson's Rule.	
7-10	Unit 5: Logarithmic, Exponential, and Transcendental Functions	• Develop, use properties and find derivatives of functions of natural logarithmic function. • Use and analyze the Log Rule for Integration to integrate a rational function. • Verify that one function is the inverse of another. • Determine whether a function has an inverse. • Differentiate and integrate natural exponential functions. • Define, differentiate and integrate exponential functions that have bases other than e. • Develop properties of and differentiate the six inverse	• How are the properties of the natural logarithmic function used? • How do you integrate a rational function? • How do you verify the inverse of a function? • How do you differentiate and integrate natural exponential functions? • How are exponential functions used in the real world? • How do you differentiate an inverse trigonometric function? • How do you integrate

		trigonometric functions • Integrate functions whose antiderivatives involve inverse trigonometric functions.	functions whose antiderivatives involve inverse trigonometric functions?
7-10	Unit 6: Differentiate Equations	• Analyze and use initial conditions, Euler's Method and slope fields to find particular and approximate solutions of differential equations. • Solve exponential equations to model real-world situations. • Analyze and use differential equations to model and solve real-world problems. • Solve and analyze differential equations.	• How do you find solutions to differential equations? • What are ways to model exponential equations? • What are ways to model differential equations?
7-10	Unit 7: Application of Integration	• Determine the area of two curves using integration. • Determine the volume of a solid revolution using a variety of methods. • Compare the methods for finding the volume of a solid revolution. • Find the area of a surface of a revolution.	• How can you find the area of two curves? • What is the difference between finding the volume of a solid revolution and a solid with known cross sections? • How are the shell method and the disc method different when finding the volume of a solid revolution?
15-20	Unit 8:	• Analyze and find an	• How do you find an

		antiderivative using integrations by parts. ● Solve trigonometric integrals involving powers of sine, cosine, secant, tangent, and sine-cosine products with different angles. ● Explain the use of integrals in the real world. ● Analyze and use partial fraction decomposition with linear factors or quadratic factors to integrate rational functions. ● Evaluate an improper integral that has an infinite limit of integration and evaluate one that has an infinite discontinuity.	antiderivative? ● How do you solve trigonometric integrals? ● How are integrals used in the real world? ● How is partial fraction decomposition used to integrate rational function? ● How do you evaluate an improper integral?
	Techniques of Integration		
20-25	Unit 9: Infinite Series	● Determine whether a sequence converges or diverges. ● Write a formula for the nth term of a sequence. ● Analyze and use the properties of infinite geometric series. ● Analyze and use the Integral Test to determine whether an infinite series converges or diverges. ● Analyze and use the Direct Comparison Test and the Limit	● How do you know if a sequence converges or diverges? ● How do you know if a series converges or diverges? ● How do you classify a convergent series? ● After determining the polynomial approximations of elementary functions, how

		Comparison Test to determine whether a series converges or diverges. ● Classify convergent series. ● Analyze and use the Ratio Test and the Root Test to determine whether a series converges or diverges. ● Determine the polynomial approximations of elementary functions and compare them with the elementary functions. ● Determine the radius and interval of convergence of a power series. ● Differentiate and integrate a power series. ● Construct a powers series using series operations. ● Determine how to find a binomial series.	do you compare them with the elementary functions? ● How do you integrate and differentiate a power series?
15-20	Unit 10: Parametric, Vector, and Polar Calculus	● Sketch the graph of a curve given by a set of parametric equations. ● Describe two calculus problems, the tautochrone and the brachistochrone. ● Find the area of a surface revolution and explain the process.	● How do you differentiate between the two calculus problems, the tautochrone and the brachistochrone? ● How do you find velocity and acceleration vectors and the displacement and distance traveled using vectors?

		• Find velocity and accelerations vectors as well as the magnitude of vectors and explain the process. • Find displacement and distance traveled using vectors and explain the process • Analyze the polar coordinate system. • Identify several types of polar graphs and explain their differences. • Analyze and determine the area and arc lengths in polar coordinates.	• How do you differentiate between the coordinate system and graphing and the polar coordinate system and graphing in it? • How do you find the area and arc lengths in polar coordinates?
15-20	Unit 11: Additional Topics in BC Calculus	• Study and apply the formal definition of limit. • Approximate a definite integral using Simpson's Rule. • Interpret, create, and analyze differential equations using integration in order to solve real world logistic growth problems. • Analyze the work done by a constant force and a variable force. • Find the center of mass in a one-dimensional or two-dimensional system.	• What are the applications of limit? • What are the real-world applications of differential equations that use integration? • How do you find the center of mass in one-dimensional or two-dimensional systems?