Math: Honors Calculus

UNIT/Weeks (not consecutive)	Timeline/Topics	Essential Questions
3	**Pre-Calculus Review** • Real Numbers, Functions, and Graphs • Linear and Quadratic Functions • The Basic Classes of Functions • Trigonometric Functions • Inverse Functions • Exponential and Logarithmic Functions • Technology: Calculators and Computers	• How are the properties of functions and functional operations useful? • How do trigonometric and circular functions model real-world problems and their solutions? • How do rational functions model real-world problems and their solutions? • How do exponential functions model real-world problems and their solutions? • How do logarithmic functions model real-world problems and their solutions?
4	**Limits** • Limits, Rates of Change and Tangent Lines • A Numerical and Graphical Approach to Limits • Basic Limit Laws • Limits and Continuity • Evaluating Limits Algebraically • Trigonometric Limits • Limits at Infinity • Intermediate Value Theorem	• How does the derivative represent an instantaneous rate of change? • How does the integral represent the summation of an infinite set? • How do you determine that a function is continuous and/or differentiable? • Is there a way to visualize what a derivative is?
3.4	**Differentiation** • Definition of the Derivative • The Derivative as a Function • Derivatives of Inverse Functions • Derivatives of Exponential and Logarithmic Functions • Implicit Differentiation • Related Rates	• How does the derivative represent an instantaneous rate of change? • How does the integral represent the summation of an infinite set? • How do you determine that a function is continuous and/or differentiable? • Is there a way to visualize what a derivative is?
8	**Applications of the Derivative** • Linear Approximation and Applications	

	• Extreme Values • The Mean Value Theorem • The Shape of a Graph • L'Hopital's Rule • Graph Sketching and Asymptotes • Applied Optimization • Newton's Method • Antiderivativeness	• What does the graph of a function tell about the equation? • How can calculus be used to solve problems in business and economics? • How are derivatives used in optimization problems?
11.2	**Integration** • Approximating and Computing Area • The Definite Integral • The Fundamental Theorem of Calculus Part I and Part II • Net Change as the Integral of a Rate • Substitution Method • Further Transcendental Functions • Exponential Growth and Decay	• How does the graph of a function relate to its equation? • What methods involving integrals can be used to find the volume of a solid?
6	**Applications of the Integral** • Area Between Two Curves • Setting Up Integrals: Volume, Density, Average Value • Volumes of Revolution • Solving Differential Equations • Slope Fields	• How can the concept of limits be applied in mathematics? • How is the concept of a limit connected to a derivative and to an integral? • How do the graphs of the first and second derivatives relate to the function graph? • How is the rate of change reflected in its table and graph?