**Department:** Mathematics
**Course Name**: Honors Calculus


**Course Description:**
Honors Calculus is a one-year course for students who have completed a precalculus preparation. Topics covered include a unified analysis of functions, limits, differentiation, and integration, with particular attention to the need of calculus techniques in problem solving. While not intended to adhere to the AP Calculus syllabus, the course is equivalent to a one-semester, college calculus course. An emphasis on critical thinking, complex communication, collaboration, creativity, and risk-taking will prepare students for rigorous college work.


**Content:**
Functions
Limits and continuity
The derivative
Exponential, logarithmic, and inverse trigonometric functions
The derivative in graphing and applications
Integration
Applications of the definite integral
Principles of integral evaluation

**Skills:**
Define and develop the concept of a "function"
Generate graphs of equations and functions by hand and on the calculator
Combine functions
Find inverses of algebraic, trigonometric, and exponential functions
Mathematical modeling
Algebraic and graphic techniques for finding limits
Finding limits at infinity
Define and determine continuity of relations
Find tangent lines to curves
Analyze rectilinear motion
Find general rates of change
Define and calculate the derivative in terms of limits
Calculate derivatives using techniques of differentiation
Use derivative to solve related rates problems
Differentiate functions that cannot be written in the form $y = f(x)$
Differentiate logarithmic functions
Differentiate the inverse of a one-to-one function
Differentiate exponential and inverse trigonometric functions
Use L'Hopital's Rule as a method for finding limits using derivatives
Determine the exact shape of a graph and the precise locations of its key features
Find high and low points on the graph of a function
Use derivatives to analyze the graphs of polynomials
Use calculus to graph rational functions and other kind of curves
Finding absolute extrema
Solve optimization problems
Use tools of calculus to analyze rectilinear motion in depth

Calculate areas of plane regions with curvilinear boundaries using antidifferentiation
Develop and use techniques of integration
Calculate definite integrals
Use integration to analyze rectilinear motion
Find area between two curves
Find volumes of three-dimensional solids
Find the length of a plane curve
Find the area of a surface that is generated by revolving a plane curve about a line
Find integrals that involve trigonometric functions
Find integrals that contain radicals

**Text and Materials:**
Calculus, Early Transcendentals, Single Variable   Anton, Bivens, and Davis

**Methods of Instruction:**
Recitation with note taking
Guided individual practice
Interactive discussions and questioning
Graphing calculator demonstrations and exploration

**Methods of Evaluation:**
Homework check
Quizzes on partial units of study
In-class and take-home tests on complete units of study
Cumulative semester and final exam