Montclair High School
Course Syllabus

Department: Mathematics
Course: Calculus
Level: Honors
Credits: 5

Course Description:
Honors Calculus provides the student with a rigorous course in calculus with in-depth instruction in the basic concepts of calculus. The course is designed for those students not planning to take the Advanced Placement Examination in Calculus. Calculus brings together many of the concepts and procedures from algebra, geometry and trigonometry. The focus in the first half of the year will be on functions, limits and differential calculus with an emphasis on real world problems in the area of related rates, optimization and motion. The focus in the second half of the year will be on integral calculus with applications that include finding areas enclosed by the graphs of functions, finding the volumes of shapes defined by functions and calculating quantities by integrating derivative functions

Standards:
No Standards Past Algebra II

Text Title	Publisher/Author	Year/Edition	ISBN	Text Distribution
Calculus and Analytical Geometry	Prentice Hall/Varberg	1992/6th Edition	0-13-117755-9	Hard copy

Supplementary Materials:
Worksheets and Handouts

Units of Study:
The year will start with a review of basic functions that students have studied in algebra and trigonometry with an emphasis on graphs, equation solving, domain and composite functions. Students will also study logarithmic and exponential functions. Students will then study limits and their connection to the graphs of functions. The study of limits will culminate in the limit definition of the derivative. Students will then study the rules of derivatives with an emphasis on the relationship to various rates. Students will then use their knowledge of derivatives to solve real world problems with applications that include related rates, approximations, optimization and distance, rate and time problems. Integral calculus will then be developed from the study of Riemann sums and the approximation of areas on a graph. Students will then study the procedures needed to find anti-derivatives with an emphasis on the properties of integrals and the connection to area. Students will then study the Fundamental Theorem of Calculus and the procedures for evaluating definite integrals and finding the derivative of integral functions. Applications of integral calculus will include find the area between the graphs of curves, find the volumes of shapes defined by functions being rotated around lines and by calculating the accumulation of value given a function defining the rate of accumulation.

Proficiencies:

By the end of this course, students will:

- Understand and evaluate limits
- Interpret and evaluate limits to infinity and infinite limits
- Understand continuity
- Understand and explain rates of change for non-linear functions
- Understand and differentiate between instantaneous and average rates of change
- Use limits to calculate derivatives
- Use derivative rules to find derivatives of polynomial, radical, and rational functions
- Use derivative rules to find derivatives of trigonometric, logarithmic and e functions
- Use tables and graphs to evaluate derivatives
- Apply derivatives to velocity; distinguish between average and instantaneous velocity
- Use derivatives to calculate the equation of tangent and normal lines to a point on a curve
- Calculate and apply higher-order derivatives
- Derive implicitly
- Model and calculate related rates
- Understand and explain differentials
- Use derivatives to find extrema(s) and critical points
- Use derivatives to determine where a function is rising (increasing) and falling (decreasing)
- Use the first and second derivative to determine concavity
- Distinguish between absolute and relative extremas
- Graph functions using critical points, inflection points, rising (increasing)/falling (decreasing) and concavity information
- Solve minimum/maximum problems
- Use differentials to solve problems
- Understand and explain the anti-derivative
- Calculate the indefinite integral
- Apply integrals and differential equations to motion problems
- Understand and interpret area under a curve (between the curve and the x-axis)
- Understand and explain the definite integral
- Apply integrals to model and solve problems
- Calculate the area between two functions

Evaluation & Assessment:

- Tests 55%
- Quizzes 25%
- Classwork 10%
- Homework 10%