



Math 220: Calculus I (5 credit hours)

Course Description

This is a standard first course in Calculus. Topics for this course include functions, limits, continuity, the derivative, differentiation of algebraic and trigonometric functions with applications including curve sketching, anti-differentiation and applications of integrals, the Riemann sum, and the Fundamental Theorem of Calculus

Prerequisite: Math 012, Credit is not given for both Math 220 and Math 234.

Course Objectives

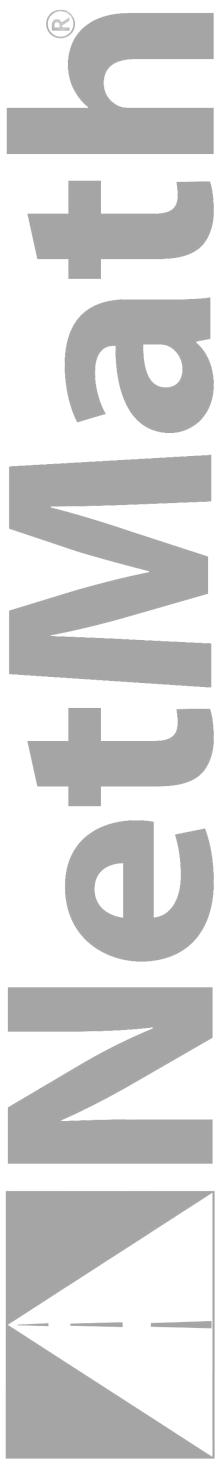
After completing this course a successful student will be able to understand and apply the topics listed above. He/she will also be able to utilize numerical, computational, and estimation techniques and devise methods of measurement. Through exploration, a successful student will be able to use geometric concepts and relationships to describe and model mathematical ideas. He/she will also have the necessary tools to formulate and solve problems in both mathematical and everyday situations. Most importantly, a student completing this course will be able to communicate mathematical ideas through descriptive language as well as mathematical symbols.

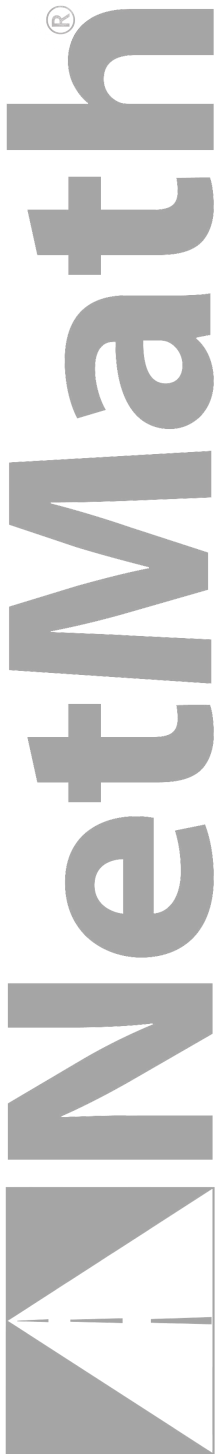
Course Content and Format

Content

A brief outline of topics for this course appears below:

- Growth
 - Line functions and polynomials
 - Interpolation of data
 - Comparing/contrasting trigonometric functions
 - Dominant terms/limiting values in the global scale
- Exponential and Logarithmic functions
 - Similarities/Differences compared to linear functions
 - Constructing a function given data
 - Applications of these functions to finance, half-life, etc.





- Instantaneous Growth Rate
 - Finding the limiting case of average growth rates
 - Calculating derivatives using the instantaneous growth rate formula
- Rules of Derivatives
 - How product and chain rule are related
 - Calculating instantaneous percentage growth rate
 - Finding max. and min. points of a function and/or its graph
- Differential Equations
 - Examining three basic differential equations and their solutions
 - Changing parameters to manipulate a solution
 - Plotting and analyzing approximations to solutions
 - Applying the Race Track principle to explain similar plots
- Integrals for Measuring Area
 - Properties of Integrals
 - Applying area formulas to solving integrals
 - Integration using Trapezoidal rule and Riemann sums
- The Fundamental Theorem of Calculus
 - Defining and applying the theorem to distance, velocity, acceleration
 - Finding the area between two curves
 - Relating the fundamental formula to differential equations
- 3D Measurements
 - Measuring area, volume, density, mass
 - Approximating arc length and finding accumulated growth
 - Calculating volumes of various solids
 - Finding proportions of area and volume

Format

Math 220 utilizes the CAS-ILE system. See <https://cas-ile.illinois.edu/> for more information. This online system helps students learn math topics through dynamic exploration and visualization.

Exams for Math 220 are done with pencil and paper and no calculator is necessary.