



## 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

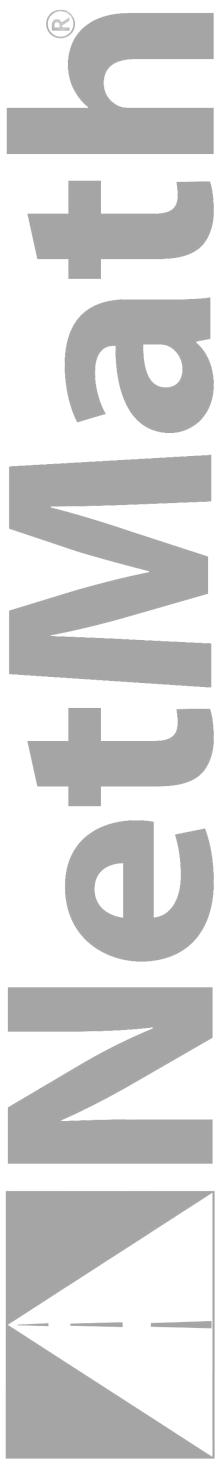
After completing this course a successful student will be able to understand and apply the topics listed above. He/she will also be able to utilize numerical, computational, and estimation techniques and devise methods of measurement. Through exploration, a successful student will be able to use geometric 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 taken online and no calculator is necessary.