

University of Arkansas – Fort Smith
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General Syllabus

MATH 2804.H Calculus I Honors

Credit Hours: 4

Lecture Hours: 4

Laboratory Hours: 0

Prerequisite: MATH 1715 Precalculus Mathematics or required placement score

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

Develops the standard topics of Calculus I from the perspective of the historical development of calculus and its reciprocating influence on society. Readings from original sources and extensive writing are required. Topics include concepts, techniques, and applications of limits, continuity, derivatives, and integrals of algebraic, exponential, logarithmic, trigonometric, and inverse trigonometric functions. Appropriate technology is used to discover relationships and to work problems not usually possible to work by hand.

B. Additional Information - None

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to:

1. Relate the derivative in calculus to the slope from analytic geometry.
2. Find limits of functions.
3. Perform the fundamental operations of differentiation and integration.
4. Differentiate and integrate examples of algebraic, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
5. Find maximum and minimum function values, and apply these techniques to obtain optimal solutions to problems from the natural sciences, economics, and the social sciences.
6. Find the area of a region bounded by curves and the volume of a solid of revolution.
7. Utilize technology to approximate derivatives and integrals.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will identify a problem or issue; research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, and bias relevant to the problems/issues; generate solutions/analysis of problems/issues evaluated; and assess and justify the solutions and/or analysis.

Quantitative Reasoning: Students will assign and use numbers, read and analyze data, create models, draw inferences, and support conclusions based on sound mathematical reasoning. Students will apply appropriate mathematical models to solve problems; represent mathematical information symbolically, visually, numerically, verbally, and interpret models and data to draw inferences; and recognize limits of quantitative analysis.

Communication Skills (written and oral)

Students will communicate proficiently by composing coherent documents which are appropriate for the intended audience and will effectively communicate orally in a public setting, such as presentation for peers or at conferences.

III. Major Course Topics

- A. The Cartesian Plane and Functions
 - 1. Functions and their representations
 - 2. Linear models and rates of change
 - 3. Polynomial, power functions, exponential functions, and logarithmic functions
- B. Limits and Their Properties
 - 1. Definition
 - 2. Limit laws
 - 3. One-sided limits
- C. Differentiation
 - 1. Finding the derivative of a function
 - 2. Differentiability
 - 3. Differentiability and continuity
 - 4. The power rule
 - 5. The constant multiple rule
 - 6. The sum rule
 - 7. The product and quotient rules
- D. Applications of Differentiation
 - 1. Extrema of Functions
 - 2. The Mean Value Theorem
 - 3. Concavity and Inflection points
 - 4. Optimization problems
- E. Integration
 - 1. Indefinite integrals

2. Integration by substitution
 3. Area
 4. The definite integral
 5. The first Fundamental Theorem of Calculus
 6. The second Fundamental Theorem of Calculus
- F. Geometric Applications of Integration
1. Area between curves
 2. Volumes
 3. Volumes by cylindrical shells
 4. Work