MATH 1BHP: HONORS CALCULUS II SEMINAR

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	1
Hours:	1 lecture per week (12 total per quarter)
Corequisite:	MATH 1BH.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students will use formal definitions with theorems and mathematical proof techniques to prove indefinite, definite, and improper integrals, properties of integrals, and relevant theorems.
- Students will complete applied real world problem projects with solutions and relevant explanations, accompanied with the use of mathematical typesetting software.

Description

An honors seminar for MATH 1BH. In this course, students will explore a multitude of advanced problems from the calculus II honors course, including proofs of the fundamental theorems, properties of integrals, integration techniques, and various other theorems and propositions concerning the behavior of integrable functions. As the calculus II honors course will require students to submit typed technical solutions to applied problems, this seminar will support students in learning how to use mathematical typesetting software. Best practices for mathematical writing will also be discussed.

Course Objectives

The student will be able to:

a. State and prove integrals.
b. State and prove properties of integrals.
c. State and prove relevant theorems.
d. Demonstrate an understanding of applications of the integral.

Course Content

a. State and prove integrals
    i. The Reimann integral
        1. Reimann integrable functions
    ii. Epsilon-delta proofs of Reimann integrals
    iii. Proofs of improper integrals using the formal definition
        1. Local integrabality
    iv. Prove indefinite integrals by applying the Fundamental Theorem of calculus
    v. Proofs of integrals involving the formal definition of partition of sets
b. State and prove properties of integrals
    i. Additive property
    ii. Linear property
    iii. Monotone property
    iv. Absolute property
    v. Adjacent interval property
    vi. Even and odd functions
    vii. Boundedness properties
c. State and prove theorems
    i. Fundamental Theorem of calculus part I and II
    ii. Mean Value Theorem for integrals part I and II
    iii. Integration by substitution
    iv. Integration by parts
d. Demonstrate an understanding of applications of the definite integral
    i. Physics applications
    ii. Engineering applications
    iii. Volumes
    iv. Average value
    v. Separable differential equations
        1. Exponential decay
        2. Newton's Law of Cooling
        3. Slope fields
        4. Mixture problems
    vi. Lengths of curves

Lab Content

Not applicable.

Special Facilities and/or Equipment

1. Access to graphing technology, such as a graphing calculator or graphing software
2. Access to mathematical typing software

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Typed formal proofs
Special applied projects
In-class presentations

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Discussion
Cooperative learning projects

Representative Text(s) and Other Materials

Briggs, W., L. Cochran, and B. Gillett. Calculus Early Transcendentals, 3rd ed.. 2018.

Instructor-generated materials, such as excerpts from:

1. Trench, William F. Introduction to Real Analysis. Free Edition Open Textbook Online.
2. Lay, Steven R. Analysis With an Introduction to Proof, 5th ed. 2014.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

a. Homework problems covering the subject matter from the text. Honors students will be assigned more of the challenging problems from the text on a regular basis.
b. Special applied projects: At least one applied real world project which will be typed using appropriate math typing software. Projects will also be presented in class.
c. Typed proofs: Formal proofs which will be typed and accompanied with math typing software.

Discipline(s)

Mathematics