MATH 1AHP: HONORS CALCULUS I 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 1AH.
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

- Use formal definitions and theorems with mathematical proof techniques to prove limits, derivative values, and relevant theorems.
- Complete applied real world problem projects with solutions and relevant explanations, accompanied with the use of mathematical typesetting software.

Description

An honors seminar linked to MATH 1AH. In this course, students will explore a multitude of advanced problems from the calculus I honors course, including proofs of limit laws, differentiation rules, and corresponding theorems concerning the behavior of differentiable functions. As the calculus I 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:

1. State and prove limits.
2. State and prove derivatives.
3. State and prove theorems.
4. Demonstrate an understanding of applications of the derivative.

Course Content

1. State and prove limits
   a. Epsilon-delta proofs of limits
   b. Proofs of limit laws
   c. Proofs involving continuity
   d. L'Hospital's Rule
2. State and prove derivatives
   a. Epsilon-delta proofs
      i. Derivative values
      ii. Second derivative values
   b. Proofs of derivative rules
      i. Power rule
      ii. Product rule
      iii. Derivatives of logarithmic functions
      iv. Derivatives of trigonometric functions
      v. Derivatives of inverse functions
3. State and prove theorems
   a. Mean Value Theorem
      i. Rolle's Theorem
   b. Intermediate Value Theorem
   c. Extreme Value Theorem
   d. The Squeeze Theorem
4. Demonstrate an understanding of applications of the derivative
   a. Related rates
   b. Optimization
   c. Linear approximations
   d. Differentials

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.
3. When taught via Foothill Global Access, ongoing access to computer with email software and hardware; email address.

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

1. 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.
2. 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.
3. Typed proofs: Formal proofs which will be typed and accompanied with math typing software.

Discipline(s)

Mathematics