BAKER COLLEGE
STUDENT LEARNING OUTCOMES

MTH4510 Introduction to Real Analysis
3 Semester Hours

Student Learning Outcomes & Enabling Objectives

1. Generalize notions of limits, continuity, and derivatives.
    a. Define limits, continuity, and derivatives.
    b. Create examples to illustrate limits, continuity, and derivatives.
    c. Determine limits, continuity, and derivatives of specific functions.
2. Validate proofs of limits using the epsilon-delta technique.
    a. Construct proofs of the sum, product, quotient, and composition theorems for limits.
    b. Construct a proof of the squeeze theorem.
    c. Calculate specific examples using explicit epsilon and delta values.
    d. Construct proofs involving different types of quantified statements.
3. Validate basic proofs of continuity for standard mathematical functions.
    a. Construct proof of sum, product, quotient, and composition theorems for continuity.
    b. Calculate specific examples using explicit epsilon and delta values.
4. Apply basic techniques of real analysis to theorems involving derivatives of functions.
    a. Construct proofs of the general derivative theorems.
    b. Construct proofs of derivatives for polynomial, rational, exponential, and logarithmic functions.
    c. Compute specific examples using explicit limit computations.
5. Interpret derivatives in terms of optimization of functions.
    a. Define maximum, minimum, and critical points.
    b. Outline the main ideas required to complete the proofs of the Mean Value Theorem and Rolle's Theorem.
6. Generalize epsilon-delta techniques to functions of two variables.
    a. Define an appropriate generalization of limit to functions of two variables.
    b. Re-write basic theorems related to limits for functions of one variable to apply to functions of two variables.
    c. Define an appropriate generalization of continuity to functions of two variables.
    d. Re-write basic theorems related to continuity for functions of one variable to functions of two variables.
    e. Demonstrate example epsilon-delta proof techniques for simple functions of two variables.

Big Ideas and Essential Questions

Big Ideas:

- Limits and one-sided limits; when these exist.
- Continuity of a function on a set.
- The application of the epsilon-delta proof technique to limits and continuity.

Essential Questions:

1. What is a limit? What is continuity? What is the relationship between the two?
2. What are the common strategies and "tricks" related to limits and epsilon-delta proofs?
3. How does the property of "continuity" factor into proofs about derivatives?
4. What is the formal definition of a derivative?

These SLOs are not approved for experiential credit.

Effective: Fall 2017