REAL ANALYSIS 2
MATH 3610.001
FALL 2010

Instructor: Dr. J. Iaia
Office: GAB 420
Office Hours: T,Th 10-12, or by appt.
Email: iaia@unt.edu
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Time: MW 12:00-1:20
Place: CURY 110

Text: S. Lay, *Analysis With an Introduction to Proof, 4th ed.*

GRADING POLICY

Exam 1	*Sept.* 22	20%	
Exam 2	*Oct.* 20	20%	
Exam 3	*Nov.* 17	20%	
Final	*Dec.* 13	20%	$10:30am - 12:30pm$
Homework	*collected weekly*	20%	

EXAMS: Exams *must* be taken on the dates listed above and neither earlier nor later. Exceptions will be considered if a student can provide *written documentation* certifying one's absence.

HOMEWORK: Homework will be assigned and collected weekly. Several problems will be chosen at random and graded.

ATTENDANCE: *Students are responsible* for *all* work assigned and announcements made during any absence.

CODE OF CONDUCT, CHEATING: Students are expected to be *respectful of others* at all times. Any student being disruptive may be asked to leave the class meeting. *Cheating* will *not* be tolerated and anyone found guilty of cheating is subject to *failure* for the semester.

The **Student Evaluation of Teaching Effectiveness (SETE)** is a requirement for all organized classes at UNT. This short survey will be made available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in feedback from students, as I work to continually improve my teaching. I consider the SETE to be an important part of your participation in this class.

STUDENTS WITH DISABILITIES: It is the responsibility of students with disabilities to provide the instructor with appropriate documentation from the Dean of Students Office.

Last day to drop with automatic W: Oct. 5

Last day to drop with W or WF : Oct. 29

GRADE DISTRIBUTION: A 90- ; B 80-89; C 70-79; D 60-69; F 0-59

Course Description

This course is a continuation of Math 3000 Real Analysis 1. We will begin talking about sequences of real numbers, convergence of sequences, limits of functions, and continuity of functions. Next, we will prove some fundamental results about continuous functions - the Maximum Value Theorem and the Intermediate Value Theorem. In addition we will discuss the derivative of a function, the mean value theorem, and Taylor's theorem.

Course Objectives

By the end of this course, students should be able to compute the limit of a sequence using the ϵ-N definition of convergence and also compute the limit of a function using the ϵ-δ definition of limit. Students should also be able to prove the Maximum Value Theorem and the Intermediate Value Theorem. In addition, students should become more comfortable proving mathematical theorems.

Course Outline

Meeting 1 - Section 16 - sequences, ϵ-N definition of convergence, calculating the limit of a specific sequences such as $\lim\limits_{n\to\infty} \frac{1}{n^2} = 0$

Meeting 2 - Section 16 - calculating the limit of more complicated sequences such as $\lim\limits_{n\to\infty} \frac{n^2+3n+9}{3n^2+7} = \frac{1}{3}$

Meeting 3 - Section 17 - the algebra of limits, i.e. proof that the limit of the sum (or difference or product) is the sum (or difference or product) of the limits

Meeting 4 - Section 17 - infinite limits, nonexistence of limits

Meeting 5 - Section 18 - monotone sequences, proof of the Monotone Convergence Theorem, Cauchy sequences

Meeting 6 - Section 18 - Cauchy sequences, proof that the limit of any Cauchy sequence of real numbers converges to some real number

Meeting 7 - Section 19 - review for exam 1

Meeting 8 - Exam 1

Meeting 9 - Section 19 - subsequences, limit superior, limit inferior

Meeting 10 - Section 19 - calculating the limit superior and limit inferior of specific sequences such as $\limsup\limits_{n\to\infty} \cos(\frac{\pi}{2}n)$ and $\liminf\limits_{n\to\infty} \cos(\frac{\pi}{2}n)$

Meeting 11 - Section 20 - ϵ-δ definition of the limit of a function, calculating the limit of specific functions such as $\lim\limits_{x\to 2} x^2 = 4$.

Meeting 12 - Section 20 - calculating the limit of more complicated functions such as $\lim\limits_{x\to 2} \frac{x^2-4}{x-2} = 4$

Meeting 13 - Section 20 - one-sided limits, nonexistence of limits

Meeting 14 - Section 21 - continuous functions, proof of the continuity of the composition of continuous functions

Meeting 15 - review for exam 2

Meeting 16 - Exam 2

Meeting 17 - Section 21 - proof that $\lim_{x\to a} f(x) = L$ if and only if $\lim_{n\to\infty} f(x_n) = L$ for every sequence with $\lim_{n\to\infty} x_n = a$

Meeting 18 - Section 22 - proof of Maximum Value Theorem

Meeting 19 - Section 22 - proof of the Intermediate Value Theorem

Meeting 20 - Section 23 - uniform continuity, examples of functions which are continuous on open intervals which are not uniformly continuous

Meeting 21 - Section 23 - uniform continuity, proof that the limit of a continuous function on a compact set is uniformly continuous

Meeting 22 - Section 25 - definition of the derivative of a function and calculation of derivatives of specific functions such as $f(x) = 5x + 6$ and $f(x) = x^n$ when n is a positive integer

Meeting 23 - review for exam 3

Meeting 24 - Exam 3

Meeting 25 - Section 25 - the algebra of differentiable functions, proof of the product rule and the quotient rule

Meeting 26 - Section 26 - proof of the Mean Value Theorem, proof that a function with 0 derivative must be constant

Meeting 27 - Section 26 - proof of L'Hopital's rule

Meeting 28 - Section 28 - proof of Taylor's theorem, review for the final exam

Meeting 29 - Final Exam