Math 3000.001 **Real Analysis I** **Fall 2010**

LECTURE: MWF 9 – 9:50 in GAB 206.

INSTRUCTOR: William Cherry
OFFICE: GAB 405
PHONE: 565-4303
E-MAIL: `wcherry@unt.edu`
WEB PAGE: `http://wcherry.math.unt.edu/math3000`
OFFICE HOURS: Mondays & Tuesdays 1:30–4:30, Wednesdays 11:15–1, and by appointment.
Not available: Sep 4–12, Sep 21, or any Thursdays

PREREQUISITE(S): Math 1720

TEXT: Steven R. Lay, *Analysis, with an Introduction to Proof,* Fourth Edition, Prentice Hall, 2005.

GRADES: There will be four components to your final grade, weighted as follows:

Homework: 20%
Class Presentations: 5%
In Class Tests: 45% (15% each)
Final Exam: 30%

Students are also expected to complete a student evaluation of teaching.

IMPORTANT DATES:

FINAL EXAM: Monday, December 13, 8 – 10 a.m.
IN CLASS TESTS: September 24, October 29, December 3

ATTENDANCE: Class attendance will not be taken, but experience shows that students who do not regularly attend class tend not to get good grades. **No late homework** will be accepted, and in class presentations must be presented as scheduled. **Students must plan to attend the midterm and final exams.** Makeup final exams will be given only in extremely exceptional circumstances, such as serious illness, and must be arranged in advance.

ACADEMIC DISHONESTY: Cheating on exams is a serious breach of academic standards and will be punished severely. UNT's full policy on academic integrity can be found at:
`http://vpaa.unt.edu/academic-integrity.htm`.

STUDENT EVALUATION OF TEACHING EFFECTIVENESS (SETE): The 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. Please be sure to complete this important survey for all of your classes.

Note: It is the responsibility of students with certified disabilities to provide the instructor with appropriate documentation from the Dean of Students Office.

Course Description

A better title for this course might be "how to think like a math major." This class will be considerably different than any previous math class you have probably had. Unlike your previous classes, there are no important mathematical "facts" to learn from this class. Generally, we will not be learning any computational "rules." Instead, the important part of this class is teaching you to learn how to "prove" mathematical statements and to learn to communicate like a math major. "Answers" are not the important part of this class, but rather formal explanations as to why the "answers" are correct. You will recognize some of the ideas presented in this class from your calculus courses, but we will look at them much more critically here than you did in calculus.

Learning Objectives

Math 3000 contributes to the following mathematics undergraduate program objectives:

Mathematical Reasoning

MR 1. Read, understand, formulate, explain, and apply mathematical statements.

MR 2. Formulate conjectures by considering examples that move from the specific to the general.

MR 3. Distinguish between valid and fallacious arguments.

MR 4. State and apply important results in key mathematical areas, with the ability to provide proof-based arguments of these and related results.

MR 5. Use a variety of techniques – such as, mathematical induction, proof by contradiction, or direct application of axioms and previously proven theorems – to prove propositions.

General skills

GS 1. Solve mathematical problems individually and cooperatively.

GS 2. Formulate strategies for solving novel analytical – both theoretical and applied – problems.

GS 3. Communicate, both verbally and in writing, mathematical ideas at a variety of levels from technical to intuitive.

Where to get help

Math 3000 is NOT one of the courses eligible for math lab tutoring. If you are having trouble, please make full use of your instructor's office hours. If the scheduled office hours are not convenient for you, make an appointment for another time. Working together with other students is also a good way to get help, but just be sure you are also able to work alone when it comes time to take the tests.

Homework

In this course, "how" you write up your homework is the most important aspect of homework. Often you are told the "answer" in advance, and the goal of the homework problem is to "prove" the answer is correct.

Homework assignments must be neatly written and must have at most one problem per sheet of paper.

NO late homework will be accepted.

Class Presentations

Every student will be assigned a presentation to be given during one of the Friday class meetings.

Tentative Course Outline

The following is intended to provide a rough outline of what will be covered when in class. Depending on how quickly students master certain concepts, more or less time may be devoted to particular topics than indicated here. Students should consult the more detailed schedules that will be distributed weekly during the course for more up-to-date information on what will happen each week.

Chapter 1: Logic and Proof: Aug 27 – Sep 24		
Monday	**Wednesday**	**Friday**
		8/27: Introduction and Logical Connectives
8/30: Logical Connectives HW due	9/1: Quantifiers HW due	9/3: Quantifiers HW due
9/6: **Labor Day** No Class	9/8: Proof Techniques HW due	9/10: Proof Techniques HW due
9/13: Proof Techniques HW due	9/15: Proof Techniques HW due	9/17: Proof Techniques Presentation(s)
9/20: Proof Techniques HW due	9/22: Proof Techniques HW due	9/24: **TEST 1** Chapter 1
Chapter 2: Sets and Functions: Sep 27 – Oct 22		
Monday	**Wednesday**	**Friday**
9/27: Set Operations HW due	9/29: Set Operations HW due	10/1: Set Operations Presentation(s)
10/4: Relations HW due	10/6: Relations HW due	10/8: Relations Presentation(s)
10/11: Functions HW due	10/13: Functions HW due	10/15: Functions Presentation(s)
10/18: Cardinality HW due	10/20: Cardinality HW due	10/22: Cardinality Presentation(s)
Chapter 3: The Real Numbers: Oct 25 – Dec 8		
Monday	**Wednesday**	**Friday**
10/25: Induction HW due	10/27: Induction HW due	10/29: **TEST 2** Chapter 2
11/1: Ordered Fields HW due	11/3: Ordered Fields HW due	11/5: Ordered Fields Presentation(s)
11/8: Completeness HW due	11/10: Completeness HW due	11/12: Completeness Presentation(s)
11/15: Topology HW due	11/17: Topology HW due	11/19: Topology Presentation(s)
11/22: Topology HW due	11/24: Modern Set Theory HW due	11/26: **Thanksgiving** No Class
11/29: Compactness HW due	12/1: Compactness HW due	12/3: **TEST 3** Chapter 3
12/6: Compactness HW due	12/8: Review	12/10: **Reading Day** No Class
12/13: **Final Exam** 8–10 a.m.		