

# Math 3000.002 – Real Analysis I

## Spring 2017

**Instructor:** Dr. Matthew Dulock

**Email:** [matthew.dulock@unt.edu](mailto:matthew.dulock@unt.edu)

**Office/Office Hrs:** 422 GAB / MW 2:00 – 5:00 PM, F 2:00 – 4:00 PM

**Course Meets:** MWF 1:00 – 1:50 PM in WH 112

**Textbooks:**

- (Required) *Analysis: with an Introduction to Proof* 5<sup>th</sup> edition by Steven R. Lay
- (Recommended) *Book of Proof* 2<sup>nd</sup> edition by Richard Hammack (Available online free of charge here <http://www.people.vcu.edu/~rhammack/BookOfProof/>; you can purchase a paper copy from amazon for about \$16.)

**Course Description:**

A better title for this course might be “*how to think like a mathematician.*” This class will be considerably different than any previous math class you have taken (most likely). Unlike previous classes, there are not many important mathematical “facts” to learn from this class (though there are a few!). Generally, we will not be learning any computational “rules.” Instead, the important part of this class is teaching you how to write mathematics in a precise fashion and how to construct proofs of theorems. We are not concerned much with “getting the right answer,” 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 in a different way than you did in calculus.

**Grading Scheme:**

Homework- 15%

Quizzes – 10%

Exams – 75%\*

*\*There are 3 midterms and a comprehensive final exam. Among these, the highest 3 scores will count for 25% each. In particular, you may choose to omit the final in which case your exam average will be computed from the midterms.*

**Homework:** Assignments concerning the material covered during a given week will **typically** (but not always) be collected the following Friday. In any math class and especially this one, practice is essential to mastering the material. You should therefore expect to spend substantial time each week on the homework. **Your lowest homework grade will be dropped.** When writing your assignments please observe the following rules.

1. You are encouraged to work together, but you must write your solutions independently and in your own words.
2. When asked to prove a theorem, your proof must be in complete sentences.
3. Do not introduce new symbols or variables without defining them.
4. You must write legibly, staple pages together, and leave one line between problems.

**Quizzes:** Periodically (except during exam weeks) there will be a short quiz on the material from the prior week. They will not always be on a predetermined day of the week so plan on attending class! The quizzes are meant to check that you are keeping up with the basic concepts as they are introduced; they are not intended to be exceptionally difficult or tricky. I will drop your two lowest quiz grades.

**Final Exam Date and Time:** Saturday May 6<sup>th</sup> 10:30 – 12:30 PM in WH 112

**Make-up Policy:** Make up exams will not be given for any reason after the scheduled date. One reason I drop the lowest exam grade is to cover emergency circumstances which may arise unexpectedly. An exam may be taken **prior** to the scheduled date if you have a conflict with another obligation and can provide documentation. I require notification a week in advance for this accommodation.

**Academic Dishonesty:** Cheating will not be tolerated. Any student caught cheating will receive a “0” on the assignment and a report will be filed with the Office of Academic Integrity.

**Advice:** This course tends to be difficult for most students. However, you will benefit far more by struggling with a difficult problem than you will by having a solution presented to you. I highly recommend you start the homework early and think about a troubling problem for at least two days before seeking help.

**Disability Accommodations:** *The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the Office of Disability Accommodation website at <http://www.unt.edu/oda>. You may also contact them by phone at 940.565.4323.*

**START WORKING NOW:** The best way to ensure you pass this course is to work consistently throughout the semester. In mathematics courses topics always build one upon the other making it very difficult to catch up later if you fall behind. If you need to pass this course because it is your last semester, your financial aid depends on it, your scholarship depends on it, or your parent/guardian has threatened to harm you in some manner then do yourself a favor and start studying right away. **I will not entertain any pleas for extra credit or offers to do additional work at the end of the semester.**

## **Summary of Key Dates – Spring 2017:**

### **January 17, Tuesday**

Classes begin.

### **January 30, Monday (5:00 p.m.)**

Last day to add/swap a class. Cannot swap up to a higher level class, only down.

### **January 31, Tuesday**

Beginning this date a student who wishes to drop a course must first receive written consent of the instructor.

### **February 24, Friday**

Last day to drop a course or withdraw from the university with a grade of “W” for courses that a student is not passing; after this date a grade of “WF” may be recorded.

### **February 25, Saturday**

Beginning this date instructors may drop students with a grade of “WF” for non-attendance.

### **March 13, Monday – March 19, Sunday**

Spring Break – No classes

### **April 4, Tuesday**

Last day to drop a course with consent of instructor (W or WF)

### **April 17, Monday**

Beginning this date a student may request a grade of “I”, incomplete, a non-punitive grade given only if a student (1) is passing, (2) has justifiable reason why the work cannot be completed on schedule; and (3) arranges with the instructor to complete the work.

### **April 21, Friday**

Last day for an instructor to drop a student with a grade of “WF” for non-attendance.

Last day to withdraw (drop all classes) from the semester.

### **May 6, Saturday – May 12, Friday**

Final examinations. Terms ends.

## Course Calendar - Spring 2017

*I reserve the right to change this schedule as necessary throughout the semester. You are still responsible for being aware of any changes I announce in class even if you were not present.*

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
1/16 MLK Day – No Class	1/17 Classes begin	1/18 Propositional connectives	1/19	1/20 Connectives / Quantifiers
1/23 Quantifiers (cont'd)	1/24	1/25 Techniques for proofs	1/26	1/27 Techniques for proofs (cont'd)
1/30 Sets theory	1/31	2/1 Set theory (cont'd)	2/2	2/3 Ordered pairs and relations
2/6 Equivalence relations	2/7	2/8 Equivalence relations (cont'd)	2/9	2/10 Functions
2/13 Functions (cont'd)	2/14	2/15 Induction	2/16	2/17 Induction (cont'd) / Equinumerous sets
2/20 Cardinality	2/21	2/22 Cardinality / Ordered fields	2/23	2/24 <b>Exam 1</b>
2/27 Ordered fields (cont'd)	2/28	3/1 Completeness axiom	3/2	3/3 Completeness axiom (cont'd)
3/6 Completeness axiom (cont'd) / Topology of R	3/7	3/8 Topology of R (cont'd)	3/9	3/10 Topology of R (cont'd)

3/13 SPRING BREAK	3/14 SPRING BREAK	3/15 SPRING BREAK	3/16 SPRING BREAK	3/17 SPRING BREAK
3/20 Compactness	3/21	3/22 Compactness (cont'd)	3/23	3/24 <b>Exam 2</b>
3/27 Compactness (cont'd) / Convergence	3/28	3/29 Convergence (cont'd)	3/30	3/31 Convergence (cont'd) / Limit techniques
4/3 Limit techniques (cont'd)	4/4	4/5 Limit techniques (cont'd)	4/6	4/7 Monotone convergence theorem
4/10 Monotone convergence theorem (cont'd)	4/11	4/12 Cauchy sequences	4/13	4/14 Cauchy sequences (cont'd)
4/17 Subsequences	4/18	4/19 Subsequences (cont'd)	4/20	4/21 Limit inferior / superior
4/24 Limit inferior / superior (cont'd)	4/25	4/26 Catch up if behind / review	4/27	4/28 <b>Exam 3</b>
5/1 Limits of functions	5/2	5/3 Continuity and the extreme value theorem	5/4	5/5 Reading Day Final exams begin on Saturday 5/6
5/8 FINAL EXAMS	5/9 FINAL EXAMS	5/10 FINAL EXAMS	5/11 FINAL EXAMS	5/12 FINAL EXAMS