

Real Analysis I

Lecture. Monday, Wednesday from 2:20pm — 3:40pm, WH 215

Instructor. Jackson Morrow

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Course Website. <https://unt.instructure.com/courses/148566> (Canvas page)

Office Hours. Wednesdays 4:00pm — 5:00pm, Thursdays 1:00pm — 2:00pm, or by appointment

Course Prerequisites. MATH 1720 and MATH 2000

Textbook. Steven R. Lay, *Analysis, with an Introduction to Proof*, Fifth Edition, Prentice Hall, 2014.

Topics. Introduction to mathematical proofs through real analysis. Topics include sets, relations, types of proofs, continuity, and topology of the real line.

Homework. Homework consists of reading the textbook and problems sets. Problem sets will be assigned weekly. The problem set of the week will be posted on the course website on Thursday or Friday and will be due the following Friday. Your homework will be submitted online through Canvas. Please make sure to make good clean scans when submitting your materials. 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.

Late homework will not be accepted under any circumstances. In case of extended illness, please contact me as soon as possible. Note that two homework scores will be dropped before final grades are computed. You are encouraged to discuss the problems with your classmates, but you must write your solutions on your own and acknowledge collaborators/cite references (e.g., websites) if any. A select number of problems will be graded. The lowest two scores will be dropped.

Attendance. I have great respect for students who are balancing the demands of their coursework with other responsibilities. Since this is an upper level course, I do expect students to attend each class, but I do understand if you need to miss a class here and there. You do not need to alert me to sporadic absences, but if you are going to be missing a substantial amount of class, please let me know.

To succeed in the class, I recommend reviewing definitions and theorems proved before each class. This will help you stay up to date on what’s going on and make it easier to follow what is happening in class. That being said, if you do not follow everything live in class (e.g., maybe a proof was unclear to you), do not worry! This happens to almost everyone and is completely normal. When a proof is confusing, make sure to mark it in your notes and review it later on your own or come to office hours to ask about it.

Tests and Exam. We will have two in-class, closed book, and closed note tests and a final exam. The final exam will be cumulative, but have a heavier focus on materials covered after the second midterm. Test dates are not negotiable, so do not make any plans conflicting with the exams.

No books, notes, or any electronic devices (including but not limited to calculators and phones) are allowed during the tests.

Test #1: September 30

Test #2: November 18

Final Exam: Saturday December 5 from 1:00pm – 3:00pm

Grading. Homework = 30%, Test #1 = 20%, Test #2 = 20%, Final exam = 30%.

The lower score of the two test will be replaced by the score of the final if this increases your total score. If you miss both of the tests or if you miss the final, you will fail the course.

Letter grades will be determined by the weighted average of the above components: 90% or better will be at least an A; 80% or better will be at least a B; 70% or better will be at least a C; 60% or better will be at least a D.

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 posted weekly during the course for more up-to-date information on what will happen each week.

Monday	Wednesday
8/17 Logical connectives	8/19 Quantifiers
8/24 Proof Techniques	8/26 Proof Techniques/Set Theory
8/31 Set Theory	9/2 Ordered pairs/relations
9/9 Equivalence relations/functions	9/11 Functions
9/14 Induction	9/16 Equinumerous sets
9/21 Countable/Uncountable sets	9/23 Ordered Fields
9/28 Completeness axiom	9/30 Test 1
10/5 Completeness axiom	10/7 Topology of $\mathbb{R}$
10/12 Spring break	10/14 Spring break
10/19 Topology of $\mathbb{R}$	10/21 Compactness
10/26 Compactness	10/28 Convergence
11/2 Convergence/Limit techniques	11/4 Limit Techniques
11/9 Monotone sequences	11/11 Cauchy sequences
11/16 Subsequences	11/18 Test 2
11/23 Limit superior and inferior	11/25 Constructing $\mathbb{R}$
11/30 Limits and continuity	12/2 Review

Announcements. I will frequently update the class page on my website with class information and new materials. You will receive email notifications about these announcements. You are responsible for making sure you are up to date with all this.

University Policies

Academic Integrity Policy. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

Unauthorized Aids During Examinations and Assessments Students may use only those materials and resources that are expressly authorized by the instructor for a particular examination or assessment. Touching, holding, or accessing any unauthorized aid during the examination period constitutes a violation of the Student Code of Conduct, regardless of whether the aid is used. Any item that may be considered an unauthorized aid must be kept out of view and in a closed container (e.g. zipped backpack, buttoned purse, etc.) during the entirety of the examination or assessment. Unless specifically authorized in writing by the instructor, prohibited aids include, but are not limited to:

- Mobile phones and smartphones
- Smartwatches and fitness trackers with communication, recording, or internet capabilities
- Tablets, laptops, and other computing devices
- Earbuds, headphones, and other audio devices
- Smart glasses, cameras, recording devices, and wearable technology
- Artificial intelligence (AI) tools, chatbots, and other generative AI technologies
- Notes, textbooks, study guides, formula sheets, or reference materials
- Any other device, material, or resource not expressly permitted by the instructor

Students are responsible for clarifying any questions about permitted materials before the examination begins.

ADA Policy. The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable 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 reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class.

Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website (<http://www.unt.edu/oda>). You may also contact ODA by phone at (940) 565-4323.

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004). The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.

Emergency Notification & Procedures. UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Acceptable Student Behavior. Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunities to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's Code of Student Conduct <https://deanofstudents.unt.edu/conduct> to learn more.

Access to Information – Eagle Connect. Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect <https://it.unt.edu/eagleconnect>.

Student Evaluation Administration Dates. Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the semester to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website (<http://spot.unt.edu/>) or email spot@unt.edu.

Survivor Advocacy. UNT is committed to providing a safe learning environment free of all forms of sexual misconduct. Federal laws and UNT policies prohibit discrimination on the basis of sex as well as sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking and/or sexual assault, there are campus resources available to provide support and assistance. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565-2648.

Class Recordings & Student Likenesses. In case synchronous (live) sessions in this course will be recorded for students enrolled in this class section to refer to throughout the semester: Class recordings are the intellectual property of the university or instructor and are reserved for use only by students in this class and only for educational purposes. Students may not post or otherwise share the recordings outside the class, or outside the Canvas Learning Management System, in any form. Failing to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.

Academic Support & Student Services

Student Support Services

Mental Health. UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- Student Health and Wellness Center
(<https://studentaffairs.unt.edu/student-health-and-wellness-center>)
- Counseling and Testing Services
(<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- UNT Care Team (<https://studentaffairs.unt.edu/care>)
- Psychiatric Services
(<https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry>)
- Individual Counseling
(<https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling>)

Chosen Names. A chosen name is a name that a person goes by that may or may not match their legal name. If you have a chosen name that is different from your legal name and would like that to be used in class, please let the instructor know. Below is a list of resources for updating your chosen name at UNT.

- UNT Records
- UNT ID Card
- UNT Email Address
- Legal Name

UNT euIDs cannot be changed at this time. The collaborating offices are working on a process to make this option accessible to UNT community members.

Pronouns. Pronouns (she/her, they/them, he/him, etc.) are a public way for people to address you, much like your name, and can be shared with a name when making an introduction, both virtually and in-person. Just as we ask and don't assume someone's name, we should also ask and not assume someone's pronouns. You can add your pronouns to your Canvas account so that they follow your name when posting to discussion boards, submitting assignments, etc. See <https://www.myprounouns.org> for additional information.

Additional Student Support Services.

- Registrar (<https://registrar.unt.edu/registration>)
- Math Lab (<https://learningcenter.unt.edu/math-lab>)
- Financial Aid (<https://financialaid.unt.edu>)
- Student Legal Services (<https://studentaffairs.unt.edu/student-legal-services>)
- Career Center (<https://careercenter.unt.edu>)
- Multicultural Center (<https://idea.unt.edu/multicultural-center>)
- Counseling and Testing Services
(<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- Pride Alliance (<https://idea.unt.edu/pridealliance>)
- UNT Food Pantry (<https://studentaffairs.unt.edu/food-pantry>)
- Academic Resource Center (<https://clear.unt.edu/canvas/student-resources>)
- Academic Success Center (<https://success.unt.edu/asc>)
- UNT Libraries (<https://library.unt.edu>)
- Writing Center (<https://writingcenter.unt.edu>)