Math 2000.003: Spring 2026

Meets: TR 12:30-1:50 in Matthews Hall, Room 114.

Instructor: Professor John Quintanilla

E-mail:: John.Quintanilla@unt.edu.

Office: General Academic Building, Room 418-D

Office Phone: None. Instead, please reach me by e-mail to set up an appointment to chat by Zoom or Microsoft Teams. (The main phone number for the front desk of the Department of Mathematics is 940-565-2155.)

Office Hours: Tuesdays 9-11, or by appointment. I encourage you to make an appointment if you're unable to see me during office hours, as I may not be able to accommodate drop-in visits. If coming to campus is an issue, you are welcome to schedule a meeting with either Zoom or Teams.

Required Text: *Discrete Mathematics with Applications*, 5th Edition, by Susanna S. Epp. The textbook is available in both electronic and hardcopy form from the UNT Bookstore.

Strongly Recommended: The lecture notes for the semester will be available on Canvas. You are welcome to print these out at home. If you have sufficient print credits, you also can print these on campus. For more information about procedures and guidelines regarding the use of printers on campus, please see http://computerlabs.unt.edu/.

Technology: Any standard scientific calculator is acceptable for this class.

Prerequisite: Math 1710 (may be taken concurrently by math majors).

Course Topics

The following chapters and sections of the textbook will be covered according to the projected schedule below. Dates may change as events warrant.

- Chapter 1: Speaking Mathematically
  - 1.2 The Language of Sets
- Chapter 2: The Logic of Compound Statements
  - 2.1 Logical Form and Logical Equivalence
  - 2.2 Conditional Statements
- Chapter 3: The Logic of Quantified Statements
  - 3.1 Predicates and Quantified Statements I
  - 3.2 Predicates and Quantified Statements II
  - 3.3 Statements with Multiple Quantifiers
- Chapter 4: Elementary Number Theory and Methods of Proof
  - 4.1 Direct Proof and Counterexample I: Introduction
  - 4.2 Direct Proof and Counterexample II: Writing Advice
  - 4.3 Direct Proof and Counterexample III: Rational Numbers
  - 4.4 Direct Proof and Counterexample IV: Divisibility
  - 4.5 Direct Proof and Counterexample V: Division into Cases and the Quotient-Remainder Theorem
  - 4.7 Indirect Argument: Contradiction and Contraposition
  - 4.8 Indirect Argument: Two Classical Theorems
- Chapter 5: Sequences, Mathematical Induction, and Recursion
  - 5.1 Sequences
  - 5.2 Mathematical Induction I: Proving Formulas
  - 5.3 Mathematical Induction II: Applications
  - 5.4 Strong Mathematical Induction and the Well-Ordering Principle for the Integers
  - 5.6 Defining Sequences Recursively
  - 5.7 Solving Recurrence Relations by Iteration
- Chapter 6: Set Theory

- o 6.1 Set Theory: Definitions and the Element Method of Proof
- o 6.2 Properties of Sets
- Chapter 7: Functions
  - o 7.1 Functions Defined on General Sets
  - o 7.2 One-to-One and Onto, Inverse Functions
  - o 7.3 Composition of Functions
- Chapter 8: Properties of Relations
  - o 8.1 Relations on Sets
  - o 8.2 Reflexivity, Symmetry, and Transitivity
  - o 8.3 Equivalence Relations
  - o 8.4 Modular Arithmetic with Applications to Cryptography

January 13	Lecture #1	5.1, 5.6, 5.7	Sequences
January 15	Lecture #2	5.1	Series and Products
January 20	Lecture #3	5.2	Mathematical induction
January 22	Lecture #4	5.3, 5.4	Mathematical induction
January 27	Lecture #5	5.3, 5.4	Mathematical induction
January 29	Lecture #6	1.2	Sets
February 3	Lecture #7	2.1	Propositional logic
February 5	Lecture #8	2.2	Propositional logic
February 10	Lecture #9	2.2	Propositional logic
February 12	**Exam #1**	**Lectures 1-6**	**Review #1**
February 17	Lecture #10	3.1, 3.2, 3.3	Predicate logic
February 19	Lecture #11	3.1, 3.2, 3.3	Predicate logic
February 24	Lecture #12	4.1	Writing direct proofs
February 26	Lecture #13	4.2, 4.3, 4.4, 4.5	Constructive proofs, counterexamples, cases
March 3	Lecture #14	4.1-4.5	More on writing proofs
March 5	Lecture #15	4.7	Contradiction and contraposition
		SPRING BREAK	
March 17	Lecture #16	4.1-4.7	More on writing proofs
March 19	**Exam #2**	**Lectures 7-14**	**Review #2**
March 24	Lecture #17	6.1	Set operations
March 26	Lecture #18	6.2	Proofs about sets
March 31	Lecture #19	6.2	Proofs about sets
April 2	Lecture #20	7.1, 7.2	Functions
April 7	Lecture #21	7.2, 7.3	One-to-One and Onto
April 9	Lecture #22	8.2, 8.3, 4.5	Congruence relationships, division algorithm
April 14	Lecture #23	8.3	Congruence classes
April 16	Lecture #24	8.4	Modular arithmetic, Euclidean algorithm
April 21	Lecture #25	8.4	Applications of modular arithmetic
April 23	**Exam #3**	**Lectures 15-21**	**Review #3**
April 28	Lecture #26	8.4	RSA encryption
April 30	Lecture #27	8.1, 8.2, 8.3	Relations
May 7, 10 am-12pm	**FINAL EXAM**		**Review #4**

Student Responsibilities

- Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity 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 Center for Student Rights and Responsibilities 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.

- You should read over this syllabus carefully, as I will hold you responsible for the information herein.
- Students will be expected to read the chapters carefully, including the examples in the book.
- Students will be responsible for obtaining any and all handouts. If you are not in class when handouts are given, it is **your** responsibility to obtain copies.
- **You should begin working now.** Frequent practice is crucial to the successful completion of a mathematics course. Cramming at the last minute will certainly lead to failure.
- **WARNING:** If you are in academic trouble, or are in danger of losing your financial support, or if your parent or guardian is expecting a certain grade at the end of the semester... start working today. I will refuse to listen to any pleas at the end of the semester. You will receive precisely the grade that you *earn*.

Grading Policies

Final Exam	18%
Exam 1	18%
Exam 2	18%
Exam 3	18%
Mastery Assignments	14%
Homework	14%

A	90% and above
B	80% and below 90%
C	70% and below 80%
D	60% and below 70%
F	below 60%

Cooperation is encouraged in doing the homework assignments. However, **cheating will not be tolerated on the exams**. If you are caught cheating, you will be subject to any penalty the instructor deems appropriate, **up to and including an automatic F for the course**. Refer to the following university site for the official policy with regards to academic dishonesty: http://vpaa.unt.edu/academic-integrity.htm.

In this course, I want you to engage deeply with the materials and develop your own critical thinking and writing skills. For this reason, the use of Generative AI (GenAI) tools like Claude, ChatGPT, and Gemini is not permitted. While these tools can be helpful in some contexts, they do not align with our goal of fostering the development of your independent thinking. Using GenAI to complete any part of an assignment, exam, or coursework will be considered a violation of academic integrity, as it prevents the development of your own skills, and will be addressed according to the Student Academic Integrity policy.

A	90-100%	Outstanding, excellent work. The student performs well above the minimum criteria.
B	80-89.99%	Good, impressive work. The student performs above the minimum criteria.
C	70-79.99%	Solid, college-level work. The student meets the criteria of the assignment.
D	60-69.99%	Below average work. The student fails to meet the minimum criteria.
F	0-59.99%	Sub-par work. The student fails to complete the assignment.

The grade of "I" is designed for students who are unable to complete work in a course but who are currently passing the course. The guidelines are clearly spelled out in the *Student Handbook*. Before you ask, you should read these requirements.

Attendance

Attendance is not required for this class. However, you will be responsible for everything that I cover in class, even if you are absent. It is my experience that students who skip class frequently make poorer grades than students who attend class regularly.

Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. This means looking alive in class and working through the examples in lecture and recitation as we go. It is assumed you will do this. The instructor will not repeat whole lectures or offer personal lessons in office hours or email. These venues are for specific questions / problems. You will be responsible for everything that I cover in class, even if you are absent. **In math courses, especially this one, the content will build upon itself making it very difficult to catch up if you fall behind.**

It is important that you communicate with the professor prior to being absent, so you and the professor can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor if you are unable to attend class meetings, especially in cases of illness.

Exam Policies

- I expect to give exams on the days shown above. However, these are tentative dates. I will announce the exact date of each exam in class.
- You will be expected to bring to class a calculator that can perform the calculations described in class.
- After exams are returned in class, you have 48 hours to appeal your grade. I will not listen to any appeals after this 48-hour period.
- I will not drop the lowest exam score; all will count toward the final grade.
- Students missing an exam for unauthorized reasons will receive 0 (zero) points on the exam. Students will be required to provide *official written* verification of any authorized absences.
- The Final Examination will be comprehensive in the sense that problems may come from any of the sections that will be covered during the semester.
- The grade of A signifies *consistent* excellence over the course of the semester. In particular, an A on the final is not equivalent to an A for the course.
- I reserve the right to test and quiz you on problems which are generalizations of material covered in the class and/or in the text. In short, the problems may not look exactly like the ones in the book.
- Everything that I say in class is fair game for exam material. You will be responsible for everything unless I advise you to the contrary.

Homework/Mastery Assignment Policies

- Homework will be assigned and collected via Canvas and will be due Tuesdays at 11:59 pm. An exception may be made for the final week of the semester.
- Homework should be uploaded as a single PDF file.
- I expect the assignments that you turn in to be written up carefully and neatly, with the answers clearly marked. You must show all of your work. **Messy homework will not be accepted.**
- Entire homework assignments will not be graded. Instead, only five representative problems will be graded per assignment. As a consequence, it will be possible to not do the entire assignment and still receive a perfect score on that particular assignment. **Deliberately leaving homework uncompleted is highly unrecommended**, however, as the law of averages will surely catch up with you as the semester progresses.
- When computing grades, I will drop the **two** lowest homework grades before computing the homework average. Therefore, in principle, you could get a 100% homework score and also not turn in two assignments during the semester. I have this policy in case you get sick, a family emergency arises, etc., during the semester. You will still be responsible for the material in such assignments during the examinations.
- I will **not** give extensions on homework assignments, nor will I accept late assignments.

- Mastery assignments on different topics will be assigned throughout the semester. Unlike regular homework assignments, you can attempt these weekly, and your highest score will count toward the final grade. So, for example, if you get a perfect score on your first attempt for a certain topic, there will be no need to re-attempt that same topic.
- As long as you keep attempting a mastery assignment, it will be reassigned to you in Canvas if you make less than a perfect grade. However, after two consecutive weeks with no submissions, that mastery assignment will no longer be automatically reassigned; instead, the student in this situation must ask the instructor In order to receive the assignment in the future.

Note to TNT Students

- If you're pursuing secondary teacher certification through Teach North Texas, then you may be aware that you will be required to construct a preliminary teaching portfolio in EDCI 4500 (Project-Based Instruction) and a final portfolio during your final semester of student teaching. Section 2 of this portfolio will ask you to demonstrate your knowledge of your content field. You may find that some of the assignments may naturally become artifacts toward part of this task, and so I encourage you to keep your work after the semester is over to make the eventual construction of your portfolio easier. You may even want to write (and save for later) a brief reflection on the artifact you select, rather than try to remember why the artifact you chose was important once you reach EDCI 4500.
- The specific indicators in the portfolio related to knowledge of mathematical content are as follows:
  - Reflect on one or more artifacts in which you state a mathematical theorem or conjecture and apply both formal and informal mathematical reasoning to the same conjecture.
  - Reflect on one or more artifacts that show your ability to describe a mathematical concept that can be represented in multiple ways and articulate the connections between its representations in clear, expository prose. Where relevant, identify appropriate technology for exploring the concept and explain limits the technology may place on the knowledge acquired.
  - Reflect on one or more artifacts that show your ability to generate a model of a natural phenomenon or describe an already existing model and evaluate how well the model represents the situation, including consideration of the risks, costs, and benefits of the alternatives.
  - Reflect on one or more artifacts that show your ability to identify a topic in your subject area and describe its connection with prerequisite topics, future topics, and other subjects.
  - Reflect on one of more artifacts that show how you bring out the historical and cultural importance of your subject material, its contribution to large ideas, and its significance in today's society. Include a specific lesson plan that incorporates the general history and cultural context of modern science or of mathematics as these fields have evolved.
- Just to be clear: the above are suggestions for TNT students. This is NOT a course requirement for Math 2000.

UNT 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.

ADA Policy

UNT 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 a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students 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 ODA website (https://disability.unt.edu/).

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.

Retention of Student Records

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior
Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity 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 long semesters 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.

Homework Expectations

The purposes of homework are to give you practice doing problems and to provide you with feedback on your work. In order for the homework grader to evaluate your work it is essential that you neatly write your homework in an organized manner. Homework which is sloppy or difficult to read will not be graded. Try to minimize your use of arrows when showing the flow of your solution. Use complete English sentences to convey your thoughts. Below are two examples of solutions to the problem of solving the inequality $x^2 + 4x > 5$. One is not acceptable while the other is fine. Which would you rather grade?

$x^2 + 4x > 5$

$x^2 + 4x - 5 > 0$

$x^2 + 4x + 4 - 9 > 0$

$(x+2)^2 - 9 > 0$

$(x+2+3)(x+2-3) > 0$

$(x+5)(x-1) > 0.$

In order for a product of two numbers to be positive, either both are positive or both are negative.

Case 1: $x+5 > 0$ and $x-1 > 0.$

$x > -5$ and $x > 1.$

$\therefore x > 1.$

Case 2: $x+5 < 0$ and $x-1 < 0$

$x < -5$ and $x < 1$

$\therefore x < -5.$

The solution is $\{x \mid x > 1 \text{ or } x < -5\}.$

$x^2 + 4x > 5$

$= x^2 + 4x > 5 - 4x$

$= x(x+4) > 5$

$= x > 5 \quad x > 1$

$= x^2 + 4x - 5 > 0$

$= (x+2)^2 - 4 - 5 > 0$

$= (x+2)^2 > 9$

$x + 2 > 3$

$x > 5$

$x > 1$

$x + 2 > -3$

$x > -5$