Math 2000.001: Spring 2016

Section 1 Meets: TR 11:00-12:20 in Auditorium Building, Room 212.
Section 2 Meets: TR 2:00-3:20 in General Academic Building, Room 438. Please note that I have a 3:30 class in Sage Hall immediately after our class, and so I won't have time to talk after class if you have a question. However, you are welcome to talk with me either before class in my office or else walk with me to my next class.

Instructor: Professor John Quintanilla

Office: GAB, Room 418-D

Office Phone: x4043

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

Web page: http://www.math.unt.edu/~johnq/Courses/2016spring/2000/

Office Hours: Mondays and Wednesdays 8:30-11:30, or by appointment. I'm fairly easy to find, and you're welcome to drop by outside of office hours without an appointment. However, there will be occasions when I'll be busy, and I may ask you to wait or come back later.

Required Text: *Discrete Mathematics and Its Applications*, 6th edition, by K. H. Rosen. ISBN-10: 0073229725. ISBN-13: 978-0073229720.

Strongly Recommended: Lecture notes for the semester can be purchased from the Eagle Images Print Center for approximately $25. The Eagle Images Print Center is in room 221 of the University Union.

The lecture notes for the semester will also be available on Blackboard. You are welcome to print these out at home; however, be aware that it's probably far cheaper to purchase the notes at Eagle Images than to purchase the ink cartridges and paper necessary to print out all of the notes. If you have sufficient print credits, you also can print these on campus. For more information about print credits and other rules and regulations regarding the use of printers on campus, please see http://computerlabs.unt.edu/printing.

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

Course Description: Introduction to proof-writing, logic, sets, relations and functions, induction and recursion, combinatorics and counting techniques.

Prerequisite: Math 1650 and Math 1710 (may be taken concurrently).

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: The Foundations: Logic and Proofs
  - 1.1 Propositional Logic
  - 1.2 Propositional Equivalencies
  - 1.3 Predicates and Quantifiers
  - 1.4 Nested Quantifiers
  - 1.6 Introduction to Proofs
- Chapter 2: Sets, Functions, Sequences, and Sums
  - 2.1 Sets
  - 2.2 Set Operations
  - 2.3 Functions
  - 2.4 Sequences and Summations
- Chapter 4: Induction and Recursion
  - 4.1 Mathematical Induction
  - 4.2 Strong Mathematical Induction and Well-Ordering
  - 4.3 Recursive Definitions and Structural Induction
- Chapter 5: Counting
  - 5.1 The Basics of Counting
  - 5.2 The Pigeonhole Principle
  - 5.3 Permutations and Combinations
  - 5.4 Binomial Coefficients
  - 5.5 Generalized Permutations and Combinations (time permitting)
- Chapter 7: Advanced Counting Techniques
  - 7.1 Recurrence Relations
  - 7.2 Solving Linear Recurrence Relations
  - 7.4 Generating Functions (time permitting)
  - 7.5 Inclusion-Exclusion
  - 7.6 Applications of Inclusion-Exclusion

January 19	Lecture #1	2.3, 2.4, and 7.1	Sequences and series
January 21	Lecture #2	2.4 and 7.1	Arithmetic and geometric sequences and series
January 26	Lecture #3	2.4	Other series
January 28	Lecture #4	4.1	Mathematical induction
February 2	Lecture #5	4.1, 7.1	Mathematical induction
February 4	Lecture #6	4.2, 7.1	Mathematical induction
February 9	Lecture #7	7.2	Linear recurrence relations
February 11	Lecture #8	7.2	Linear recurrence relations
February 16	Lecture #10	1.1, 1.2	Propositional logic
February 18	**Exam #1**	Lectures 1-6	Review #1
February 23	Lecture #11	1,1, 1.2	Propositional logic
February 25	Lecture #12	1.1, 1.2	Propositional logic
March 1	Lecture #13	1.3, 1.4	Predicate logic
March 3	Lecture #14	1.3, 1.4	Predicate logic
March 8	Lecture #15	1.3, 1.4	Predicate logic
March 10	Lecture #16	1.6	Writing direct proofs
SPRING BREAK			
March 22	Lecture #17	1.6	Direct proofs, counterexamples, contrapositives
March 24	**Exam #2**	Lectures 7-8, 10-15	Review #2
March 29	Lecture #18	1.6	Proofs by contradiction and proofs of equivalence
March 31	Lecture #19	1.6	Proofs
April 5	Lecture #20	2.1	Sets
April 7	Lecture #21	2.2	Set Operations

April 12	Lecture #22	2.3	Functions
April 14	Lecture #23	5.1, 5.2	Combinatorics
April 19	Lecture #24	5.1, 7.5, 7.6	Inclusion-Exclusion
April 21	Lecture #25	5.3	Permutations and Combinations
April 26	Lecture #26	5.3	Permutations and Combinations
April 28	**Exam #3**	Lectures 16-22	Review #3
May 3	Lecture #27	5.4	Binomial Coefficients and the Binomial Theorem
May 5	Lecture #30	7.4	Generating functions (time permitting)
May 10, 10:30 am-12:30 pm	**FINAL for morning section**		Review #4
May 12, 1:30-3:30 pm	**FINAL for afternoon section**		Review #4

If there is time at the end of the semester, we will cover Section 5.5, Generalized Permutations and Combinations.

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

The following schedule is tentative and is subject to capricious changes in case of extracurricular events deemed sufficiently important to the upper administration.

Final Exam		20%
Exam 1	c. Week 5	14%
Exam 2	c. Week 9	14%
Exam 3	c. Week 14	14%

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

Fibonacci Assignment		3%
Twin Primes Project		7%
Solution Guide Project		7%
Solution Guide Evaluation		7%
Homework		14%

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.

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. You should consider this if you don't think you'll be able to wake up in time for class consistently.

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.

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 and Project Policies

- Homework will be collected in class every Tuesday. Weekly assignments will be posted on Blackboard.
- 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.
- Two class projects (on the Fibonacci numbers and on the Twin Primes Conjecture) will be assigned on Blackboard.

Solution Guides

- All students will be randomly assigned to groups to prepare homework solution guides. The groups as well as detailed instructions from writing an effective solution guide can be found on Blackboard.
- Each solution guide will be due one week after the corresponding homework assignment has been submitted. I encourage groups to make contact with each other at least one week (and maybe two weeks) before the due date.
- Each group must debate choices of word and notation, as well as choice of correct proof to include based on aesthetic taste. The solution guide will be distributed to the whole class via Blackboard. All students will work on this project once this semester.
- All students (including the authors of the solution guide) will be required to complete a short questionnaire on each solution guide, asking if the guide provided effective and well-crafted mathematical communication. All students will receive a participation grade for completing the questionnaire, while the results of the questionnaire will be used to give a grade to the solution guide's authors.

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 EDSE 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 EDSE 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.

Final Note

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.