Home	E-mail	Homework
Dr. Quintanilla	Math Department	University of North Texas

Math 4050.001: Fall 2017

Meets: MWF 9:00-9:50 in Wooten 321.

Also meets: Students will be divided into two groups and are responsible for coming to four special sessions, spaced two or three weeks apart, starting the second week of class. These sessions will be held in GAB 473. You will have the choice of these two time slots:

- Wednesdays 12-1:30 on 9/6, 9/20, 10/13, 11/1
- Thursdays 9:30-11 on 9/7, 9/21, 10/14, 11/2

Again, you will only be responsible for coming to these sessions on four different days! That said, you are welcome to come to the other sessions even if you're not presenting.

Instructor: Professor John Quintanilla

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Web page: http://www.math.unt.edu/~johnq/Courses/2017fall/4050/

Office Hours: Mondays and Wednesdays 10-12 and 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.

Required Text: *Mathematics for Secondary School Teachers*, by E. G. Bremigan, R. J. Bremigan, and J. D. Lorch. Course topics are chosen to ensure all TNT math majors are exposed to the topics listed in the program standards for initial preparation of secondary mathematics published by the National Council of Teachers of Mathematics. Course topics are also chosen to ensure that your future students are prepared for the mathematics portion of the Texas College and Career Readiness Standards.

Strongly Recommended: Lecture notes for the semester can be purchased from the Eagle Images Print Center for approximately $12. The Eagle Images Print Center is in room 221 of the University Union.

Prerequisite: Math 3000. See http://meangreenmath.com/2013/10/27/all-i-want-to-be-is-a-high-school-math-teacher-why-do-i-have-to-take-real-analysis/.

For Your Information: Dates and other information about the practice state certification exam may be found at http://www.coe.unt.edu/texes. Other good (and free) resources for preparing for the state certification exam are T-CERT and http://www.online.math.uh.edu/texes4to8/. Information about the real TExES Mathematics 8-12 certification exam can be found by following the link.

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

- Chapter 4: Trigonometry
  - 4.5: Trigonometry, Coordinate Geometry, and Linear Algebra
    - 4.5.3: Complex multiplication
- Chapter 7: Operations in Number Systems
  - 7.6: Complex Numbers
    - 7.6.3: Polar decomposition
    - 7.6.4: The geometric meaning of complex multiplication
- Chapter 8: Topics in Number Systems
  - 8.1: Arithmetic in the Integers
    - 8.1.1: Divisors and multiples
    - 8.1.2: Greatest common divisors and least common multiples
    - 8.1.3: Primes
    - 8.1.4: The Fundamental Theorem of Arithmetic: http://meangreenmath.com/2013/09/15/formula-for-a-finite-geometric-series-part-8/
    - 8.1.5: Applications of FTA
    - 8.1.6: The Division Algorithm
  - 8.2: Systems of Numeration for Whole Numbers:
    - 8.2.3: Hindu-Arabic numeration http://meangreenmath.com/2014/12/30/calculator-errors-when-close-isnt-close-enough-index/, http://meangreenmath.com/2013/08/01/square-roots-without-a-calculator-part-1/, http://meangreenmath.com/2013/08/02/square-roots-without-a-calculator-part-2/
  - 8.3: Divisibility Tests
    - 8.3.1: Familiar tests and their proofs: http://meangreenmath.com/2013/06/24/divisibility-tricks/, http://meangreenmath.com/2013/06/24/more-on-divisibility/
  - 8.4: Decimals
    - 8.4.1: Making sense of decimals: http://meangreenmath.com/2014/12/31/thoughts-on-17-and-other-rational-numbers-index/
    - 8.4.2: Some technicalities: http://meangreenmath.com/2014/12/22/why-does-0-999-1-index/
    - 8.4.3: Rational versus irrational numbers and their decimal expansions
  - 8.5: Algebraic and Transcendental Numbers
    - 8.5.1: Definitions and examples
- Chapter 9: Exponentiation
  - 9.1: Whole Number Exponents
    - 9.1.1: Shorthand for repeated multiplication
  - 9.2: Integer Exponents
    - 9.2.1: Non-positive exponents: http://meangreenmath.com/2014/12/28/why-does-x0-1-and-x-n-1xn-index/
    - 9.2.2: Properties of exponentiation with integer exponents
  - 9.3: Rational Exponents
    - 9.3.1: Roots and dueling notations
    - 9.3.2: Rational exponents: roots and powers of the base
  - 9.4: Real Exponents
    - 9.4.1: The real exponential functions: http://meangreenmath.com/2014/12/28/why-does-x0-1-and-x-n-1xn-index/, https://meangreenmath.wordpress.com/2014/12/20/reminding-students-about-taylor-series-index/
  - 9.5: The Real Logarithmic Functions
    - 9.5.1: The logarithm: definition and properties
- Chapter 10: Exponential and Logarithmic Functions: History, Computation, and Application

- 10.1: Logarithms and History: Logarithm Tables
  - 10.1.1: Logarithm tables and interpolation: http://meangreenmath.com/2014/12/29/square-roots-and-logarithms-without-a-calculator-index/
- 10.2: Logarithms and History: The Natural Logarithm
  - 10.2.1: The natural logarithm: if it looks like a logarithm then it probably is one: http://meangreenmath.com/2015/01/28/different-definitions-of-logarithm-index/
  - 10.2.2: Estimating natural logarithms
- 10.3: Compelling Properties of the Natural Logarithm and Natural Exponential Function
  - 10.3.1: Logarithms with base α, revisited
  - 10.3.2: Inverse functions and their derivatives; the derivative of exponential functions
  - 10.3.3: More on the number e
  - 10.3.4: Summary
- 10.4: Applications of Exponential Functions
  - 10.4.1: Exponential growth
  - 10.4.2: Compound interest: http://meangreenmath.com/2013/06/07/entrance-exam-at-mit/, http://meangreenmath.com/2015/01/29/different-definitions-of-e-index/

- Chapter 11: Transcendental Functions and Complex Numbers
  - 11.2: Roots of Complex Numbers
    - 11.2.1: Examples of roots
    - 11.2.2: Main results
    - 11.2.3: Principal roots
  - 11.3: Rational Exponents: Roots and Powers of the Base
    - 11.3.1: Problems arise: negative and complex bases
  - 11.4: The Complex Exponential Function
    - 11.4.1: Definition
    - 11.4.2: Additive property of exponents
    - 11.4.3: Euler's Formula: writing e^z in terms of familiar functions
    - 11.4.4: The complex logarithm
  - 11.5: Complex Bases and Complex Exponents: http://meangreenmath.com/2015/01/05/calculators-and-complex-numbers-index/
- Chapter 12: Beyond Quadratics: Higher Degree Polynomials
  - 12.2: Connections: Roots and Coefficients
    - 12.2.1: Conjugate roots
    - 12.2.2: Rational Roots Theorem
    - 12.2.3: Descartes' Rule of Signs
  - 12.4: Factoring and the Fundamental Theorem of Algebra
    - 12.4.1: Fundamental questions lead to a fundamental theorem
    - 12.4.2: Division algorithm and factor theorem
  - 12.5: Application: Newton's Method and Polynomials
    - 12.5.2: Newton's method, polynomials, and the Remainder Theorem

August 28: 8.1.6	**August 30**: 8.1.1	**September 1**: 8.1.2
September 4: HOLIDAY	**September 6**: 8.1.3	**September 8**: 8.1.4
September 11: 8.1.5	**September 13**: 8.1.5, 8.2.3	**September 15**: 8.2.3
September 18: 8.3.1	**September 20**: 8.4.1	**September 22**: 8.4.2

September 25: 8.4.3	**September 27**: EXAM #1	**September 29**: 8.4.3
October 2: 7.6.2	**October 4**: 7.6.2, 12.4.2	**October 6**: 12.4.2, 12.5.2
October 9: 12.5.2, 12.2.2	**October 11**: 12.2.2	**October 13**: 12.4.2
October 16: 12.4.2, 12.2.1	**October 18**: 12.2.1	**October 20**: 12.4.1
October 23: Graphing polynomials and rational functions	**October 25**: EXAM #2	**October 27**: Review of Taylor series
October 30: 8.5.1	**November 1**:8.5.1, 10.4.2	**November 3**: 9.1, 9.2
November 6: 9.3.2	**November 8**: 9.4.1	**November 10**: 9.5.1
November 13: 10.1.1	**November 15**: 10.2.1	**November 17**: 10.3.1
November 20: 10.3.2	**November 22:** 10.2.2, 10.3.3, 10.3.4, 10.4.1	**November 23**: HOLIDAY
November 27: 4.5.3, 7.6.4	**November 29**: EXAM #3	**December 1**: 11.2.1
December 4: 11.2, 11.3	**December 6**: 11.4, 11.5	**December 8**: READING DAY
	December 13: Final: 8:00-10:00	

Student Responsibilities

- 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	Wednesday, December 13 8:00-10:00 am	15%
Exam 1	c. Week 5	13%
Exam 2	c. Week 9	13%
Exam 3	c. Week 13	13%
Homework from Textbook		11%
Certification Exam Preparation		11%
Out-of-Class Presentations		11%
Class Project		13%

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**.

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

- Unless announced otherwise, calculators will **not** be permitted for use on exams.
- I expect to give exams during the weeks above. However, these are tentative dates. I will announce the exact date of each exam 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.
- No make up exams will be given. For those students who miss an exam due to an **Authorized Absence** (see the *Student Handbook*), the final grade will be computed based only on those exams taken, together with homework/quiz scores and the final exam. Such students will be required to provide *official written* verification of such an absence.
- Students missing an exam for unauthorized reasons will receive 0 (zero) points on the exam.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 on Mondays and Wednesdays is fair game for exam material. You will be responsible for everything unless I advise you to the contrary.
- You will **not** be held responsible for the certification exam preparations, Friday presentations, or the two class projects on the exams.

Homework Policies

- Homework will be assigned every Friday and will be due the following Friday. All assignments will be posted online.
- Most weeks, you will be expected to work on four different assignments at once: (1) homework based on the Monday/Wednesday lectures, (2) preparation for the TExES Mathematics 8-12 certification exam, (3) Friday presentations, and (4) the class project.
- 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.**

Homework based on lectures

- 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.
- Because of this policy, I will **not** give extensions on homework assignments, nor will I accept late assignments.

Certification exam preparation

- Every week, you will be given about 12-18 problems on topics pertinent to the Mathematics 8-12 certification exam. These are mostly chosen from problems that appeared on Precalculus and Calculus I exams given by your instructor to TAMS students in past years.
- For each assignment, you will also choose 5 problems from the remaining preparation problems. If you submit more than five such problems, the grader will simply grade the first five problems on the homework assignment.
- When computing grades, I will drop the **two** lowest grades before computing the certification exam preparation average. Because of this policy, I will **not** give extensions on the certification assignments, nor will I accept late assignments.

Out-of-class presentations

- Every week, selected problems from a collection of hard questions from real high school students will be posted. Every Tuesday, students will be sent to the board, one at a time in random order, to demonstrate how they would answer these questions if posed by a future high school student.

- With these presentations, you should develop two important skills: solidifying your content knowledge of secondary mathematics and learning how to "sell" difficult ideas to your future students.
- All presentations will be peer graded.
- If you get called to the board but have an unexcused absence, you will get a 0 for this presentation.
- All presentation grades will be used to compute the Friday presentations average.
- If you really mess up on a presentation --- or are called to the board on a day that you miss class --- you are permitted once during the semester for a second-chance session to be scheduled with your instructor. At such a session, you will be asked to be prepared to answer about ten of these questions, actually answer maybe three or four, and will be directly assessed by your instructor.

Class project

- The class project concerns developing ideas to sell course content to high school students that may not like mathematics as much as you do.

Final Notes

- For the sake of completeness, I list some other areas that new teachers struggle with, according to experienced secondary teachers:
    - Being willing to seek advice from seasoned instructors
    - Covered the whole curriculum over the course of a year without getting bogged down on specific topics
    - Classroom management
    - Keeping appropriate documentation (e.g., special-needs students, communication with parents, etc.)
    - Appropriate use of classroom technology
    - Being consistent in enforcing discipline
    - Keeping authority (i.e., not just being a pal to one's students)
    - Maintaining professional distance
- 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.

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

$x^2+4x>5$

$\cancel{=x^2+4x>8-4x}$

$\cancel{=x(x+4)>5}$

$\cancel{=x>5 \quad x>1}$

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

$=(x+2)^2\cancel{+4}-4-5>\cancel{4}0$

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

$x+2>3$

$\cancel{x>5}$

$x>1$

$x+2\cancel{>}<-3$

$x+\cancel{2}<-5$