Mathematics 3400.001 Spring 2011 [MWF 11:00 to 11:50]
Number theory

Textbook.

Required. George E. Andrews, Number Theory, Dover, ISBN 0-486-68252-8.

The testbook is intended as a reference. The course will not follow the textbook. Mathematics is about understanding ideas and methods, not memorizing facts, so we will do a lot of discovery in class. Discovery depends on the students (and the instructor). It is inherently unpredictable, so the syllabus is intended only as a rough guide.

Cost of taking this course apart from UNT tuition and fees.

The required textbook is a paperback, with a list price of around $15.00. A calculator will be very useful, but by this time, you should already have one.

Grades and exams. Your final grade is determined by homework (15%), project (10 %), two tests given during the semester (25% each) and the final (25%). The letter grade will be given strictly according to the recommended university standards: D = at least 60%, C = at least 70%, B = at least 80%, and A = at least 90%.

Homework.

Homework will be assigned, usually once a week, due on Wednesday. See the individual schedules.

Attendence.

You are expected to attend all scheduled classes; Rolls will be taken by electronic means. The instructor reserves the right to give a grade of F if a student misses more than 10 (ten) class days.

Prerequisites and code of conduct.

The prerequisite course is any one of MATH 2700, 2770, 3000, any MATH 3000 course, or the permission of the instructor.

I expect you to behave in accordance with the student code of conduct. There will be **zero** tolerance of violations of this code.

Syllabus. There are at least two major areas of number theory: additive number theory and multiplicative number theory. Usually, these are done separately, but we will integrate the two. In the following syllabus, the weeks will be numbered by the increasing sequences $(m_i : i = 1, 2, 3, 4, 5, 6, 7, 8)$ and $(n_i : i = 1, 2, 3, 4, 5, 6)$, such that

$$\{m_i\} \cup \{n_i\} = \{j : j \in \mathbb{Z}, 0 \leq j \leq 13\}.$$

The sequences (m_i) and (n_i) will depend on how the course proceeds. Weeks are counted starting from 0, of course!

Additive number theory.

Week m_1. Partitions and composition of numbers. Recursions for partitions. Generating functions.

Week m_2. More on generating functions. Special kinds of partitions.

Week m_3. The number of ways of making change for a dollar, order not important. Other partition problems.

Week m_4. Product identities. The Euler pentagonal number formula. .

Week m_5. Shape of Partitions and combinatorics.

Week m_6. The Rogers-Ramanujan identities.

Multiplicative number theory.

Week n_1. Basic defintions. The Peano axioms, Induction. Division algorithm. Primes and prime factorization. Fractions and Farey fractions.

Week n_2. Divisibility, numbers to different bases, balanced number systems, modular arithmetic.

Week n_3. Arithmetic modulo a prime and modulo non-primes. Theorems of Fermat and Euler.

Week n_4. The Euler ϕ function. Dirichlet series. The lattice of divisors of a number. Möbius inversion.

Week n_5. Primes. Euler products. The Riemann zeta function.

Week n_6. Quadratic reciprocity.

Week n_7. Proofs of quadratic reciprocity.

Week n_8. Primality tests.

Week 15. Summary and review. Final on finals week. See the UNT final exam schedule for the precise time and date.

Instructor. Joseph Kung. GAB 471C. Office hours: Monday and Wednesday, 10:00 to 11:00 am, Monday 12 to 2 pm. Other times by appointment.

e-mail: kung@unt.edu [Expect some delay and possible computer breakdown when using e-mail.] phone 940-565-4084.