

Mathematics MAT 341 : Number Theory
Fall 2005
MF 2:00 pm - 3:15 pm, Room 209A

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Course Materials

A Friendly Introduction to Number Theory, 3rd Edition, by Silverman (required)

Introduction

Number Theory is the study of the set of integers $\mathbb{Z} = \{\dots, -2, -1, 0, 1, 2, \dots\}$. Because of the basic nature of the object of study (you have been dealing with them your whole life!), it is a very attractive area of mathematics. We can study number theory and understand some of the most challenging open problems in mathematics without devoting a great deal of time to the mechanics. Therein lies one of the fundamental features of Number Theory: Number Theory contains some of the simplest problems to state and the hardest to prove. In this course we will cover some elementary techniques which will help us understand the nature of the natural numbers. These include the Fundamental Theorem of Arithmetic, congruences, primitive roots, and quadratic reciprocity.

As this class meets only twice a week, it is your responsibility to make an effort to look over the material at least 30 minutes every day in addition to the time you spend on course work.

Exams

There will be a midterm exam given during the semester and a final exam. Both exams are worth 25 percent of your final grade. The exams will test your ability to recall definitions and work through some computational problems, as well as your ability to work through some of the concepts. The midterm exam is scheduled for Friday, October 21 and the final exam is at 4:00 p.m. on Monday, December 12. There will be NO make-ups for missed exams. Please look over your schedule as soon as possible. If you see a potential conflict, inform me immediately.

Homework

The best way to learn Mathematics is to solve problems. In addition to assignments to be turned in, there will also be problems to solve which we will consider "moral assignments". The problems on the moral assignments will not be turned in for a grade; however, you are responsible for the material on these assignments. You will always be given at least a week to work on the assignments to be turned in. But I will expect you to work on the problems before the next class period. You should be comfortable enough with the problems to work on them and discuss them in front of the class. Homework will count for 25% of your final grade.

Projects

Number Theory provides easy access to some of the most fascinating areas of mathematics. (Perhaps I betray my bias?) Many of the topics can be studied without very much in the way of technical background. Thus they can be studied independently. The purpose of the projects is to get you to explore a concept relating to Number Theory that we might not ordinarily cover in a course. The projects will count for 25% of your final grade. We will discuss the project more in depth the 2nd or 3rd week of the course.

Attendance

While there is no official attendance policy for MAT 341, I strongly suggest you come to class prepared every day.

Grading

Your grade in this course will be based on three main factors: homework, projects and exams. The exams will be worth 50% of your final grade, the projects 25%, and the homework 25%. In addition to these factors, minor ethereal factors such attendance, attitude, and improvement over the course of the semester can also affect your grade. To determine your final grade, 90–100% = A, 80–89% = B, 70–79%

= C, 60–69% = D, 59 and below = F, with the top two percents receiving a + and the bottom two percents receiving a –.

Important Dates

Monday, September 5 – Last Day to Drop/Add
Monday, October 10 – Fall Break (no class)
Tuesday, October 11 – Follow the Monday schedule
Friday, October 21 – Midterm
Friday, November 4 – Deadline for WD or P/F
November 23 - 27 – Thanksgiving Break (no class)
Friday, December 9 – Last Day of Classes
December 10, 11 – Study Days
Monday, December 12, 4:00 p.m. - 6:30 p.m. – Final Exam

Suggestions

Come to class with your homework assignment completed every day
Study for at least 30 minutes each day in addition to completing your homework assignment
Read the section we will be covering in class *before* arriving to class
Do not fall behind!
Come to office hours to discuss homework and concepts. I am here to help!

Syllabus

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Week 1	September 2	Chapter 2 – Pythagorean Triples
Week 2	September 5 September 9	Chapter 3 – Pythagorean Triples and the Unit Circle Chapter 5 – Divisibility and GCD
Week 3	September 12 September 16	Chapter 6 – Linear Equations and the GCD Chapter 7 – The Fundamental Theorem of Arithmetic
Week 4	September 19 September 23	Chapter 7 – (continued) Chapter 8 – Congruences
Week 5	September 26 September 30	Chapter 9 – Congruences, Power, and FLT Chapter 10 – Congruences, Power, and Euler’s Theorem
Week 6	October 3 October 7	Chapter 11 – Euler’s Phi Function and the Chinese Remainder Theorem Chapter 11 – (continued)
Week 7	October 11 October 14	Chapter 12 – Prime Numbers Chapter 13 – Counting Primes
Week 8	October 17 October 21	Review Exam I
Week 9	October 24 October 28	Chapter 14 – Mersenne Primes Chapter 15 – Mersenne Primes and Perfect Numbers
Week 10	October 31 November 4	Chapter 16 – Powers Modulo m and Successive Squaring Chapter 17 – Computing k th Roots Modulo m
Week 11	November 7 November 11	Chapter 18 – Powers, Roots, and “Unbreakable” Codes Chapter 18 – (continued)
Week 12	November 14 November 18	Chapter 19 – Primality Testing and Carmichael Numbers Chapter 20 – Euler’s Phi Function and Sums of Divisors
Week 13	November 21 November 25	Chapter 21 – Powers Modulo p and Primitive Roots NO CLASS
Week 14	November 28 December 2	** Presentations ** ** Presentations **
Week 15	December 5 December 9	** Presentations ** ** Presentations **