MATH 522: Number Theory Fall 2007

TR 4-5:15 GMCS 328

Vadim Ponomarenko `vadim@sciences.sdsu.edu`

Office: GMCS 511 4-6176, Office Hours: TR 10-10:50, 2-3:30, and by appointment

Overview:
Number theory is the study of the divisibility properties of the natural numbers.

"Mathematics is the queen of the sciences and number theory is the queen of mathematics."
Carl Friedrich Gauss, 1856
"God invented the integers; all else is the work of man."
Leopold Kronecker, 1893
"Music is part of number theory. Nowadays when a number-theorist applies for a grant, he says that it is good for security, but in those days, way before America, he would say that it's good for music. I will not comment whether we have progressed..."
Hendrik W. Lenstra Jr., 2002

Learning Objectives:
Students will master some major theorems of number theory, including the Fundamental Theorem of Arithmetic, Fermat's Little Theorem, the Chinese Remainder Theorem, and Chebychev's Theorem. Students will be able to prove these theorems, and apply them to solve problems.

Textbook:
Number Theory, by George E. Andrews, ISBN 0-486-68252-8

This course will cover Part I of the text, roughly half, at a pace of one section per class meeting on average.

Portfolio:
Students are expected to keep a portfolio in a three-ring binder or something similar, containing a detailed and complete solution to every exercise in the text (those marked $\star$ are optional). These portfolios will not be collected or checked, except upon a student's request; however, they will be an invaluable resource during exams. The exams are structured so that there will be just enough time to mimic a solution from a portfolio but not enough time to create it fresh.

Students are NOT required to personally solve every exercise appearing in their portfolios; they are strongly encouraged to collaborate with classmates. However, before accepting a classmate's solution into their portfolio, students are expected to carefully check it for completeness and correctness.

Attendance:
Students are expected to attend every class; otherwise, they are personally responsible for copying notes from a classmate. Makeup exams are not given; the lowest two exam grades are dropped, to account for the unexpected.

Course Mechanics:
Each Thursday (other than Aug. 30 and Nov. 22) there will be a 30 minute exam on the previous week's material. A typical exam will have a proof and a calculation. Of the 13 exams, the lowest two scores will be dropped, and the highest score will count double. Each exam will count 5% of the course grade. The final exam will be 30% of the course grade. Class participation will be the remaining 10% of the course grade. The grading policy is as follows: A 92-100, B 82-87, C 72-77, D 62-67, $\pm$ as obvious

Final Exam: Thursday, Dec. 13, 3:30-5:30pm.

Extra Credit:
On the next class day after an exam (before the exam is returned), students may submit extra credit to improve their grades. They may submit a revised solution to *one* problem. The grade they earn on this revised problem will be averaged with the original grade (rounding down).