Math 313 – Topics in Number Theory

Alon Levy

2012 Winter Term 2 – January-April 2013

Administrative information

My email is levy@math.ubc.ca. The TA's name is Chenglong Zou, and his email is czou@math.ubc.ca; he will handle homework grading.

Office hours are held every Monday between 12 and 2 and every Thursday between 5 and 6, at Math Annex 1102.

Syllabus information

The textbook for this class is Elementary Number Theory and Its Applications, Kenneth Rosen, 6th ed. Most lecture materials will follow the textbook; in case I deviate from it significantly in the future, I will include resources such as lecture notes or alternative textbooks, which as far as possible will be the same textbooks used in parallel UBC math classes.

As this is a topics course, the syllabus is fluid. Expect significant meandering from the core topics. The topics include,

1. A review of orders and primitive roots
2. Quadratic residues and quadratic reciprocity
3. Cryptography
4. Nonlinear (esp. quadratic) Diophantine equations
5. Continued fractions
6. The two- and four-square theorems
7. Generalizations of integers, e.g. Gaussian integers

The focus is generally on solving Diophantine equations, or proving that they have no solutions. The primary method will be reduction modulo a prime, but we will also consider methods such as infinite descent, and, depending on time constraints, factoring in the Gaussian integers or another generalization of the integers. Cryptography is included as an application of the theoretical results of primitive roots and quadratic residues.

Assessment

There will be weekly homework, two midterms, and a final. The homework is worth 20% of the grade. There will be about ten homework assignments; the bottom two will be dropped from your average, and if there are more than ten assignments, only the top eight will count.

The tests will be 80% of the grade. Each midterm will be 20% of the grade. The final will be during finals period and will be worth 40%.