Syllabus

Math 124, Fall 2005

September 21, 2005

1 General Information

- Course instructor : Véronique Godin
  - Course meeting : MWF 11-12 in S310
  - Office : S341
  - Office hours : Mondays 1pm-3pm
  - email address : godin@math.harvard.edu
- Course Assistant : Inna Zakharevich.
  - Sections : Mondays 7-8pm
  - Office hours : Tuesday at 8PM
- Grading matters
  - Weekly assignments due on each Wednesday in class : 40%.
  - Midterm on the 4th of November : 20%.
  - Final : 40%.

2 Content

The course will follow the book : "The Higher Arithmetic" by H. Davenport. It will, in particular, cover the following topics.

1. Proof by Inductions
2. Factorization and the primes
   - The fundamental theorem of arithmetic
   - Euclid's algorithm
3. Congruences
   - Fermat's theorem, Euler's ϕ function and the Chinese remainder theorem.
   - Wilson's theorem
   - Public-Key Cryptography
   - Prime power moduli

4. Quadratic Residues
    - Primitive Roots
    - Quadratic Residues
    - Gauss' lemma
    - Quadratic Reciprocity
5. Continued Fractions
    - Infinite Continued Fractions
    - Approximations to Irrational Numbers
    - Periodic Continued Fractions
    - Pell's equation
6. Sums of Squares
    - Sums of two squares
    - Representation by four squares
7. Quadratic forms
    - Equivalence and reduction of quadratic forms
    - Positive definite quadratic forms
    - The class-number
8. Diophantine equations
    - The equation $x^2 + y^2 = z^2$.
    - The equation $ax^2 + by^2 = z^2$
    - Fermat's problem
    - The equation $x^3 + y^3 = z^3 + w^3$