



T. Tao

THE UNIVERSITY OF WESTERN ONTARIO
LONDON CANADA
DEPARTMENT OF MATHEMATICS



B. Green

Elementary Number Theory - Mathematics 3150a

Fall 2011

Instructor: Ján Mináč
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Office: Middlesex College, room 131 (I also use the university campus as a large, outdoor office ☺).
Office Telephone: 519 661-2111, extension 86519.
Office Hours: Will be discussed in class.
Class Times and Location: Mondays, Wednesdays and Fridays, 9:30 a.m. – 10:30 a.m. (Please NOTE: We meet on Mondays and Fridays in UC room 222 and on Wednesdays in UC room 212)
Prerequisites: Good knowledge of undergraduate algebra.
Evaluation: Will be discussed in class.

Texts:

Elementary Number Theory, by Gareth A. Jones and Josephine M. Jones, published by Springer-Verlag, London, 1998 (ISBN 3540761977).

A Classical Introduction to Modern Number Theory, Second Edition, by K. Ireland and M. Rosen, published by Springer-Verlag, New York, 1990 (ISBN 038797329X and/or 354097329X).

These are amazing books! (The first book is the primary source book for this course, and the second book is a secondary source. *However, both books are **optional**, as the main source will be your lecture notes.*) These books contain a wealth of charming, beautiful mathematics explained in a clear and friendly way. We shall first concentrate on chapters 1, 2, 3, 4, 5, 6 and 7 in the first book, and then we shall concentrate on chapters 1, 2, 3, 4 and 5 in the second book.

Course Outline:

The fundamental theorem of arithmetic, distribution of primes, congruences, Fermat's Little Theorem, Wilson's Theorem, the quadratic reciprocity law, and some *ad hoc*, interesting (hopefully!) material enhancing these basic subjects.



L. Euler



R. Langlands



A. Granville



R. Murty



J. Labute

This will be the core of the course which we shall try to develop with many details and we shall aim at a full understanding of the basics.

In the other part of this course we shall bravely make an attempt to understand the “big picture” and the latest developments such as the Wiles-Taylor proof of Fermat’s Last Theorem, Langlands’ program, Green and Tao’s theorem on primes in arithmetical sequences, and topics in arithmetic geometry. This will often be done with bold strokes of our brushes, aiming our imagination and letting it loose; as well as freeing us from worries about details. Perhaps some of you will decide to climb this hill or that hill or to examine certain deep topics with a microscope and the obsession that such an examination may require.

Remark:

One reason why humankind may be proud today is the development of number theory. In the past only a few, usually the most outstanding mathematicians, devoted their energy to this fascinating topic. Today this theory is becoming quite popular and remarkable success was obtained in recent years. I will try to systematically develop parts of the theory and to preserve some charm, beauty and romantic dreams of the subject.

When I was a teenager I often day-dreamed and lived in my own world full of fantasy and magic. Sometimes prime numbers snuck into this world. They were puzzling and fascinating. And then I learned that there were other dreamers called mathematicians, who explore this fantasy world in a detailed way. And what a world this is! I long to share this world with you.



Scholastic offences: Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following web site:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf.