

Math 229

Introduction to Analytic Number Theory

Harvard University, Spring 2024 (Full term)

Tu-Th 10:30-11:45 SC 109

First Meeting: Tu, January 23, 10:30

— Instructor: Yuriy Drozd, SC 340

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— Office hours: Tu 1:30-2:30, Th 12:00-13:00, or by appointment

This class is a graduate level course in Analytic Number Theory, also aimed at undergraduates.

— Contents:

Analytic Number Theory, engendered by the genius of Riemann, has become a field, where the ideas and methods of quite different areas of mathematics interlace and cooperate with each other. We will present several most known chapters of this field, first of all, Prime Numbers Theorem and Dirichlet Theorem on Arithmetic Progression. We start with reminding elementary number theory and properties of the main arithmetic functions, then move to analytic methods and Dirichlet series with the final aim to prove these theorems. We also consider some other topics from Analytic Number Theory, partially taking account of the interests of the participants.

Prerequisites: Basic courses in Algebra (math 123 recommended) and Complex Analysis (math 113 recommended).

Recommended Literature (all books are available from HOLLIS in pdf format):

- H.L. Montgomery and R.C. Vaughan. *Multiplicative number theory. I. Classical theory*. (A very complete account on the modern Analytic Number Theory. Contains plenty of exercises of all levels. Most recommended).
- M. Apostol. *Introduction to Analytic Number Theory*. (Contains a lot of elementary number theory and a complete exposition on Prime Number and Dirichlet Theorems, as well as a lot of exercises)
- Chandrasekharan. *Introduction to Analytic Number Theory*. (A classical introduction into the theory)

Additional books (recommended for reading and final projects):

- G. Newman. *Analytic Number Theory*. (Contains, perhaps, the simplest and most natural proofs of Prime Number Theorem and Dirichet Theorem, but no elementary number theory)
- Iwaniec, E. Kowalski. *Analytic Number Theory*. (A very complete monograph covering plenty of topics from the Analytic Number Theory)
- Tenenbaum. *Introduction to Analytic and Probabilistic Number Theory*. (One more monograph that also covers probabilistic methods in number theory)

— Office hours and problem review sessions:

There will be weekly office hours and discussion sessions. You are all encouraged to attend, whether you have a question or no. I will answer any questions about the class and discuss more topics in number theory following requests of the students attending.

— Grading:

I will propose topics for reading and final projects which will be about 50% of the grade. Some homeworks will also be proposed; together with the participation they will count the other 50%.