MATH 7310: REAL ANALYSIS AND LINEAR SPACES I

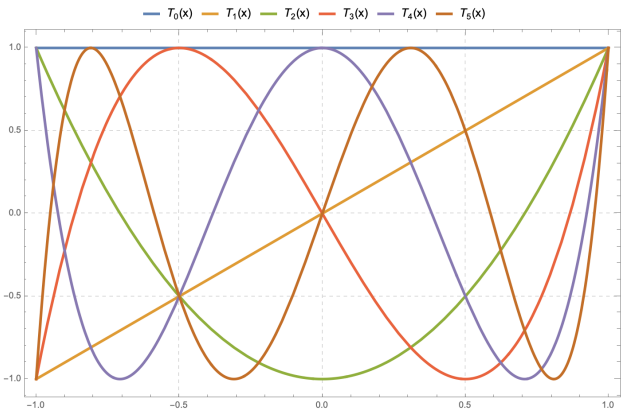
LEONID PETROV
SPRING 2019

1. *Graduate real analysis*

This course introduces students to basic analytic tools used across all of mathematics:

- Measures, including the Lebesgue measure on the line
- Lebesgue integration
- L^p and Hilbert spaces
- Absolute continuity, differentiation of measures

Additional topics included in the course will range from applications to probability (e.g., theory of conditional expectations, Gaussian measures and Gaussian Free Field, ...) to selected topics from classical analysis (orthogonal polynomials, numerical methods, steepest descent, ...), as time permits. Students' suggestions of additional topics are also welcome.



The first six Chebyshev polynomials of the first kind.

Prerequisites. Single variable and multi-variable Calculus (limits and continuity, differentiation and integration, series, uniform convergence, etc.), Linear Algebra (vector spaces, linear mappings, matrices, determinants, etc.), and some knowledge of set theory and topology of metric spaces.

2. *Necessary information*

Class times: TuTh 2:00PM - 3:15PM in *Kerchof Hall 317*

Exams: Please do not make travel plans which conflict with the first midterm or the final exam.

- **Midterm 1:** In-class on February 19 (class time).
- **Midterm 2:** Take home, due April 4.
- **Final exam:** Monday, May 6, 9-12.

Date: Compiled on Tuesday 8th January, 2019, 08:23.
An up to date syllabus is always on `GitHub` at https://github.com/lenis2000/Syllabi/blob/master/Syllabus_7310_s19.pdf. For direct PDF download use `this link`. LaTeX source with *changes* to the syllabus is `here` (click "History").

Instructor: Leonid Petrov

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Office hours: Tuesday and Thursday 10-11am, except the weeks when I'm traveling.[1] Also feel free to drop in with quick questions any time, or make appointments (you can make as many appointments as you want).

Course webpage: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and myself. Rather than emailing questions, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at https://piazza.com/virginia/spring2019/math7310/home

A collab page for homework submissions will also be set up.

3. *Books*

The exposition of each topic will follow one of the following books:

- *Real analysis: modern techniques and applications*, by G.B. Folland
- *Real and complex analysis*, by W. Rudin
- *Real analysis: Measure Theory, Integration, and Hilbert Spaces*, by E. Stein and R. Shakarchi
- *Measure Theory and Fine Properties of Functions*, by L. Evans and R. Gariepy
- *An epsilon of room: pages from year three of a mathematical blog*, by T. Tao

The first two books are considered "main", the other ones are optional but may be of use. Lecture notes (in a hand-written format) will be provided on Piazza.

[1] Note: this PDF has green clickable links.