Math 425b: Fundamental Concepts of Analysis, Part 2

Everything can change with little or no notice at any moment…

In particular, a class (lecture and/or discussion) can be moved to on-line mode on a very short notice, so please check your e-mail before every class.

Fundamental Concepts of Analysis, Part 2 (Math 425b) Spring 2024 Class number 39647R (9am MWF, KAP 148) The final exam is Friday, May 3, 8-10am

Our Math 425b in Spring 2024 semester: Key dates

- January 8: first day of classes
- January 15: MLK Day, no class
- January 26: Last day to drop without a `W' AND with refund
- February 19: Presidents' Day, no class
- February 23: Last day to drop without a `W', BUT WITH NO refund
- February 28: Midterm Exam 1
- March 11-15: Spring break
- April 5: Last day to drop with a `W'
- April 17: Midterm Exam 2
- April 26: Last day of classes; Computer project is due
- May 3: Final exam **[8am-10am, in the regular lecture room KAP 148]**

Class Schedule
Homeworks
Computer Project

- **Instructor:** Dr. Sergey Lototsky.
  Office: KAP 248 D.
  Phone: (213) 740-2389.

E-mail: lototsky (at) usc (dot) edu.
Lectures: MWF 9:00-9:50 pm, KAP 148.
Office hours: MWF 12:30-1:30pm in KAP 248.

Please make sure to talk to me about your problems, questions, or concerns in this class. We can always arrange a special zoom meeting.

- **Teaching Assistant:** Siyang Liu
  E-mail: liusiyan [at] usc (dot) edu
  Discussions: none
  Office hours: 2-3pm Tu, noon-2pm Th
- **Textbook:** "Principles of Mathematical Analysis" by Walter Rudin (any edition will do)

- **Objective:** To learn the rigorous way of thinking about differential and integral calculus, with an eye toward more advanced material.
- **Goal:** To learn everything there is in chapters 5-11 of the book and a bit more.

- **The ultimate goal:** To make you interested enough in the subject so that you take more courses in mathematical analysis and related topics, and enjoy them.

Course Work

- **There will be two one-hour exams: February 28 and April 17, both Wednesday, during regular lecture hours. Final exam is Friday, May 3, 8am-10am, in the regular lecture room (KAP 148).**
- Calculators, books, notes, on-line resources, outside help, etc. are not allowed during the exams.

Grading:

- Homeworks, 30% total
- The computer project, 10% total
- Two Mid-Term Exams, 30% total [15% each]
- Final Two-Hour Exam, 30%

Approximate Grading Scheme. A: 90 and up; B: 80-89; C: 70-79. Pluses/minuses (As in A-, B+, etc.) will mostly be decided on a case-by-case basis.

Missed work. The general rule: no make-up exams, no late submissions of homeworks or the project (but early submissions, especially in electronic format, are welcome). **Emergencies will be handled on a case-by-case basis.** If you miss the final exam, with a valid excuse, you get an incomplete in the class; an incomplete is a major inconvenience for a number of people, including yourself, so, please, do not miss the final.

To encourage and reward consistent performance throughout the semester, I will not automatically drop any scores.

Additional Information.

- **Students Requiring Special Accommodation**
  Any student requesting academic accommodations based on special needs is required to register with OSAS (Office of Student Accessibility Services) each semester. A letter of verification for approved accommodations can be obtained from OSAS. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. OSAS is located in GFS 120. To contact OSAS: (213) 740-0776 [tel.], SASfrntd@usc.edu [e-mail], on the web.
- **Academic Integrity**
  USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus (the Student Guidebook) contains the Student Conduct Code in Section 11.00, while the recommended sanctions are in Appendix A.
- **Academic Support** The Kortschak Center for Learning and Creativity

Other materials

- **Mine**
  - Motivating puzzle and answer
  - Lecture 1
  - Summary of Rudin's book
  - A theoretical summary of Calc I
  - Some short notes from Calc II: functions, limits, Taylor, prime numbers, ODEs.
  - Two summaries of linear algebra: somewhat basic and more advanced
  - Gamma and Beta Functions
  - Lambert's W function
  - The Weierstrass Approximation Theorem
  - Some names and faces behind some formulas
  - Motion in the central field
  - Grad, Div, Laplacian, and Curl in non-cartesian coordinates
  - PDEs describing fluids
  - Fourier and Laplace Transforms
  - Applications of Fourier analysis
  - PDEs (Transport, Heat, Wave, Laplace) in the whole space
  - Telegraph equation
  - Lower quality (hand-written) notes: Derivative in complex domain, Computing Radius of convergence, Power Series for Regular ODEs, Fuchs-Frobenius for singular ODEs, Uniform convergence, Intro FS, Examples of FS, Heat equation by FS, From FS to FI, Versions of FT, Properties of FT, PDEs by FT, Fun apps of FT, You have many choices, A complex path to the Fundamental Theorem of Algebra.

- **Various alternative sources**
  - Asymptotic notations (O,o,etc.)
  - Root test vs Ratio test
  - An article about the sampling theorem
  - Lambert's W function: the standard reference
  - Some inequalities for the Lambert W and related functions
  - The book **Fourier Analysis** by T. Korner (Cambridge University Press, 1988) is a great reference for many topics in this class. Here are some examples from the book:
    A nowhere differentiable function
    Analysis of the Gibbs phenomenon
    Non-uniqueness for the heat equation
    Heat equation on the half-line