Intermediate real analysis II

Course	MAT 473
Semester	Spring 2025
Line No.	18364
Time	TuTh 10:30 - 11:45 AM
Room	DH105
Instructor	Jack Spielberg

This is the continuation of MAT 472, giving a rigorous treatment of analyisis in n-dimensional Euclidean space. The first part of the course will deal with differentiation of functions between Euclidean spaces, including partial and total differentiation, Taylor's theorem, and the inverse and implicit function theorems. The remainder of the course covers Lebesgue measure and integration in $\mathbb{R}$. Lebesgue's theory is a far reaching generalization of Riemann's integral, and is an essential part of twentieth century mathematics and physics. This half of the course will be excellent preparation for the abstract measure theory in a graduate analysis course. We will go through the fundamentals of Lebesgue's measure on $\mathbb{R}$, then study integrable functions, Lebesgue's integral, and the fundamental limit theorems that make Lebesgue's theory so much better than the Riemann integral. If time permits we will also discuss Fubini's theorem in $\mathbb{R}^2$, and the change of variables theorem (very wishfully thinking).

The text from MAT 472, *Real Mathematical Analysis* by Pugh, will be a useful reference for the first half of the course, but is not required, as course notes will be posted on the web. For the second half of the course we will not follow Pugh's treatment of Lebesgue integration. Some recommended books are listed below.

1. *An introduction to analysis* by Rosenlicht
2. *Principles of mathematical analysis* by Rudin
3. *Real analysis* by Royden
4. *Lebesgue integration on Euclidean space* by Jones

There will be weekly problem sets (the most important part of the course), a midterm exam, and a final exam.

Prerequisites MAT 472 with grade of C or better, or consent of the instructor. Some familiarity with linear algebra (e.g. MAT 342 or 343) is recommended.

Interested students who have not taken MAT 472 but who have a good background in advanced calculus AND metric spaces or topology are welcome to 473. Please contact the instructor for permission to enroll.

Questions may be addressed to the instructor at jack.spielberg@asu.edu.