100211
Analysis I, Fall 2007

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Lectures: Mondays, 9:45-11:00, East Hall 3
Wednesdays, 11:15-12:30, East Hall 3

Tutorials: Fridays, 12:35-13:45, East Hall 3

Textbooks: W. Rudin, *Principles of Mathematical Analysis*, McGraw Hill Text
(The classic textbook, fairly expensive, int. edition ca. 60€)

M. Rosenlicht, *Introduction to Analysis*, Dover Publications
(Excellent cheap alternative to Rudin, ca 15€)

C. C. Pugh, *Real Mathematical Analysis*, Springer
(Excellent modern book, my favorite, ca 50€)

Grading: Your grade is determined by how many points you obtain out of 1000 possible points, i.e., the grade is assigned according to the table on the right. Points can be collected via Homework (300 pts), Quizzes (180 pts), Midterm Exam (220 pts) and Final (300 pts)

Point range	***Grade***
950 - 1000	*1.00*
905 - 949	*1.33*
860 - 904	*1.67*
815 - 859	*2.00*
770 - 814	*2.33*
725 - 769	*2.67*
680 - 724	*3.00*
635 - 679	*3.33*
590 - 634	*3.67*
545 - 589	*4.00*
500 - 544	*4.33*
455 - 499	*4.67*
0 - 454	*5.00*

Homework: Twelve problem sets will be assigned during the semester. Each homework is worth 30 points; the sum of your best 10 homework scores will determine your total homework score, i.e., your two worst homework scores are dropped at the end of the semester. The homework is due Tuesdays, noon in the Analysis I mailbox in the lobby of Research 1. Every day you hand in your homework late will be penalized by a deduction of 5 points from the respective homework score.

We encourage you to discuss homework problems with fellow students. However, the homework you hand in may not be copied and must reflect your own understanding of the material.

Quizzes Eight quizzes will be given in class (see schedule), each carrying 30 points. Only the best six quizzes will count towards your quiz score (out of 180).

Quizzes will be 5-10 minute closed book examinations. Makeup quizzes are only administered if you missed more than two quizzes (excused).

Exams: The midterm exam is worth 220 points. The final exam, worth 300 points, will be scheduled within finals week.

The material used as well as the rules for the exam will be announced one week prior to the exam.

Prerequisites: We shall only assume the most basic notions of set theory, two-valued logic (true or false), proof by induction, epsilon-delta definition of continuity of real valued functions on the real line, and the basic arithmetic operations on integers and rational numbers. A certain level of mathematical maturity (achievable through courses such as Foundations of Mathematics) is assumed.

Syllabus: A sound understanding of the topological and algebraic structure of the real number system is of fundamental importance to most mathematical fields! To convey this and some of its consequences is the principle goal of Analysis I / II.

In order to discuss topics such as convergence of sequences and series, and continuity, integration and differentiation of functions defined on the real line, we need a solid understanding of the real number system. Hence, Analysis I includes an extensive discussion of real numbers, which will then be followed by the introduction of complex numbers. The concept of distance between two real or complex numbers will lead to the definition of converging sequences and series, and of continuous functions on the real line. These ideas can be generalized to sequences in and functions on abstract metric spaces, i.e., on sets that allow us to assign a distance to any pair of two of its elements. Many results in calculus such as the intermediate and maximal value theorem can be generalized to the general (and abstract) metric space set up. Introducing general concepts such as compactness and connectedness have the additional advantage of leading to a better understanding of calculus itself. The last segment of Analysis I will deal with derivatives of functions on the real line: a function is differentiable if it can be locally approximated by linear functions. To obtain better approximations one can replace linear functions with higher order polynomials. This will lead to the concept of Taylor polynomials and series.

This course will be roughly divided into the following sections:

I. Relations and functions
II. Real and complex numbers
III. Convergent sequences and series
IV. Metric spaces and continuous functions
V. Differentiation

Schedule:

	Mon	Tue	Wed	Thu	Fri		
W1	3-Sep	4-Sep	**5-Sep**	6-Sep	7-Sep		
W2	**10-Sep**	11-Sep	**12-Sep**	13-Sep	14-Sep	HW 1 due	Q1
W3	**17-Sep**	18-Sep	**19-Sep**	20-Sep	21-Sep	HW 2 due	
W4	**24-Sep**	25-Sep	**26-Sep**	27-Sep	28-Sep	HW 3 due	Q2
W5	**1-Oct**	2-Oct	3-Oct	4-Oct	5-Oct	HW 4 due	Q3
W6	**8-Oct**	9-Oct	**10-Oct**	11-Oct	12-Oct	HW 5 due	
W7	**15-Oct**	16-Oct	**17-Oct**	18-Oct	19-Oct	HW 6 due	Q4
W8	**22-Oct**	23-Oct	**24-Oct**	25-Oct	26-Oct		MT
W9	**29-Oct**	30-Oct	**31-Oct**	1-Nov	2-Nov	HW 7 due	
W10	**5-Nov**	6-Nov	**7-Nov**	8-Nov	9-Nov	HW 8 due	Q5
W11	**12-Nov**	13-Nov	**14-Nov**	15-Nov	16-Nov	HW 9 due	Q6
W12	**19-Nov**	20-Nov	**21-Nov**	22-Nov	23-Nov	HW 10 due	
W13	**26-Nov**	27-Nov	**28-Nov**	29-Nov	30-Nov	HW 11 due	Q7
W14	**3-Dec**	4-Dec	**5-Dec**	6-Dec	7-Dec	HW 12 due	Q8
Reading &	10-Dec	11-Dec	12-Dec	13-Dec	14-Dec		
Exams	17-Dec	18-Dec	19-Dec	20-Dec	21-Dec		