

MATHEMATICS 3220-1. Spring 2002
Foundations of Analysis II.

Text: *An introduction to analysis*, by W. Wade (2-nd edition).

When/Where: TH, 2:00-3:20 PM, JTB 110.

We will have 5 min break during the class (approximately at 2:40).

Instructor: Prof. Michael Kapovich.

Office: JWB 329; **phone:** 581-7916; **e-mail:** kapovich@math.utah.edu

Office hours: TH 12:00– 1:00 p.m., or by appointment.

Prerequisites: Math 2270 (linear algebra) and 3210.

Sections of the textbook to be covered:

Sections 8.1–8.4, 9.1–9.5, 11.1–11.5, 12.1–12.4.

Exams: There will be a comprehensive final examination and three midterm exams:

Exam 1: Thursday, January 31.

Exam 2. Tuesday, April 2.

Exam 3: Thursday, May 2 (the last day of classes).

Each midterm exam is 80 minutes long.

Final Exam: Wednesday, May 8, 1:00 p.m. - 3:00 p.m. in JTB 110.

Overview: Math 3220 has two aims: the first, of course, is to teach you the foundations of analysis, i.e., the rigorous mathematical theory underlying just about everything you have learned in multi-variable calculus. The second is to teach you how to do mathematics rigorously, i.e., how to do proofs. The two aims will be inextricably intertwined: you cannot learn any mathematics rigorously without being able to understand and do proofs, and it is almost impossible to learn how to do proofs without an extended example to practice on. If you are someone who will never need to do more than apply some mathematical formulas, or perhaps use a computer algebra system to solve a differential equation, you do not need to take this course. On the other hand, if you plan on taking any higher level course in pure math-5310, etc., or if you will ever need to answer a serious question asked by an ambitious high school student, you will need this course. This is not an easy course. You are expected to spend considerable time outside of class, time when you are alert and focused, working on problems. To learn to do proofs, you must practice a lot. If you cannot do the typical homework problem which inevitably consists of proving something by the end of the semester, I cannot in good conscience, pass you. However most students at your level can learn this material. By the end of the year, the multivariable calculus will no longer seem like a hodge-podge of formulas to be memorized, but rather a coherent theoretical entity which makes sense! At some point you will really understand the proof of some theorem. Hopefully, you will appreciate the innate beauty of it all. I promise to do my best to get you there.

Ask questions both during the class, after the class if I have time, by email and during my office hours! **What to do if you do not understand the answer:** ask again. I would repeat explanation several times if necessary. However on some occasions I would ask you to repeat the question after the end of the class (our time during the class is limited).

Outline: Our goal for math 3220 is to cover chapters 8–12 of Wade’s book. We will start with a brief review of linear algebra, limits and continuity in \mathbb{R}^n . (In large part it is similar to what you have seeing in a multivariable calculus class.) We next discuss the concept which might be new for many: topology of \mathbb{R}^n (open sets, closed sets, closure, connectedness and compactness). We then return to the discussion of the more familiar subjects, like partial derivatives, inverse function theorem, Riemann integral, etc.

Homework: I will assign homework during most lectures, either from the book or problems of my own; homework assigned every given week will be due on Tuesdays. The first homework is due on January 10. If you bring the homework on Thursday you will lose 33% of the points on your homework. While homework which is more than a week late will be corrected, you will receive no points for it. It is important that you hand in even a partial solution to problems. It is absolutely essential that you do the homework as we talk about the material. You will not truly understand the definitions and theorems presented in this course without applying them to problems, nor will you learn how to write mathematical proofs without quite a bit of practice. Discussion can be an effective way to problem solving, so you are encouraged to work together on homework; I think you will find the process of explaining your ideas to others extremely helpful. A note of caution: it’s probably best to try the problems by yourself first, so that you can bring something to the discussion. Homework is also meant to teach the writing of mathematics. For that reason, I ask that after you have worked out a proof, each of you do your own final write-up.

I will post the homework problems (and solutions) on my homepage:

<http://www.math.utah.edu/~kapovich/teaching7.html>

I will also post sample problems for the tests.

Remark. For those of you who are using Internet Explorer: If you are trying to open a .pdf file and receive the message “internal error”, save the file to your directory and then reopen it from the directory. If you are using Netscape, this problem does not occur.

Fax: If you cannot attend the class on Tuesday when the homework is due, send your homework to me by fax. Make sure to put my name and the course number on the first page of your fax. My fax number is: 801 - 581 4148.

Grading: Course grades will be computed from homework scores (30%), two best midterm test scores (20% each) and the final (30%). (I will drop the lowest midterm score.) To get a passing grade you have to take the final exam.

Cell phones: Turn them off during the class.

Coming late: If you are more than 5 minutes late for the class, wait for the break and come in during the break.

ADA Statement: The Americans with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning and psychiatric disabilities. Please contact me at the beginning of the quarter to discuss any such accommodations for the course.

There will be no classes between February 2 and 26; after the Olympic break we will resume the class on February 28.