

## Math 334, (Honors) Advanced Calculus

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Lecture: MTWTh 10:30, LOW (Loew Hall) 105  
Instructor: Jim Morrow  
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Text: *Advanced Calculus* (required)  
Author: Gerald B. Folland

Math 334-5-6 is a sequence designed to cover portions of the content of Math 300, 309, 324, 327, 328, and 427. We will take a more critical point of view in studying these topics than would be usual in the courses just mentioned. By that I mean we will try to understand definitions, theorems, and proofs of some results. We will not prove everything but will try to get a deeper understanding than simply results from a formal use of mathematical techniques. I will try to motivate our study by mentioning some of the big problems that have led to the development of the topics we will study.

In Math 334 I plan to cover the following and related topics:

1. Mathematical reasoning (and informal set theory)
2. Elementary topology of  $\mathbf{R}^n$
3. Functions of several real variables
4. Derivatives of functions of several variables
5. Curves and surfaces in  $\mathbf{R}^3$
6. Integrals of functions of one and several variables
7. Line integrals
8. Green's theorem

We will cover portions of Chapters 1-5 of Folland. Some of Math 334 will be a review of subjects that you have already studied, so I hope to consolidate your understanding of these topics. You will find that each level of mathematics typically builds on prior levels and incorporates a review of earlier material. There are also some very good texts that are freely available on line. I will post links to these books on the

class webpage. Some of them (the Springer e-books for example) have to be accessed through the Math Research Library's homepage.

Homework will be collected weekly and will count 20% of the course grade. There will be two 50 minute midterm tests which will count 20% of the course grade. The midterm tests will be closed book but you will be allowed to bring notes on one side of a notebook size sheet of paper. There will be a two hour closed book final exam which will count 40% of the course grade. For the final you will be allowed to bring notes on both sides of a notebook size sheet of paper. **Electronic devices are not allowed on either test.**

I want you to feel comfortable to ask questions in class. I encourage you to interrupt me any time you feel like it. I may not give you an instant answer because your questions may force me to think and get back to you and I may not know the answer. I don't like deadly silence and I hope you will not be reluctant to talk to me. I like to engage in a mathematical argument. Mathematics does not consist of brief answers to brief questions. You should not feel that every problem has a short solution (or even any solution). Math is not simply arithmetic. After a long time you may find a somewhat complicated solution to some problem. It might also happen that by luck you leap to a simple, elegant explanation. In any case do not be discouraged if you have difficulties. The best tactic is to keep thinking. Faulty ideas are much better than no ideas. You may have only one good idea for every hundred ideas. **I also urge you to work together.** Persistence pays off. It sometimes happens that the person with the highest score on the final exam was the one who had the hardest time in the first week.

I will use the class website to post links to papers and items that you should consult. For that reason, it's important that you check the site regularly to see if there have been new items posted. That's where I will post suggested readings as well as sample problems for tests. I will also post announcements, such as possible modifications of the schedule. **It is a very good idea to work with classmates on the homework.** However each student should write up solutions in their own words. Careful and clear exposition of ideas is something I want you to learn. Mathematics should be the epitome of clarity. So you should give precise references to theorems (by name or number in the text – I prefer names to numbers) in your work. Think of the written word as being your only chance to communicate. You shouldn't expect to be asked to orally explain what you meant to say. Clarity includes good organization and good handwriting. In Spring Quarter you will write a term paper and I prefer that it be written using  $\text{\LaTeX}$ . Now is a good time to start learning it. It will take some time and you might want to practice by writing up some of the assignments using  $\text{\LaTeX}$ . It is a somewhat painful process. You will find that most technical work has to be written using  $\text{\LaTeX}$ .

I will attempt to keep to the following schedule; however I will make adjustments as necessary throughout the quarter. Midterms will cover material up to the previous homework assignments.

One final word: math is not easy, but the rewards are great. Keep at it and you will be very pleased with the results.

Here are the homework assignments (all from Folland): (Additional problems may be posted and I may not quite make to the end.) November 11, 24, and 25 are holidays. Notice that one assignment is due on Thursday, November 10.

DATE	ASSIGNMENT
Sep 30	§1.1: 4, 5, 6, 7, 8
Oct. 7	§1.2: 1eg, 2, 4, 5, 6; §1.3: 3, 4, 5, 6, 7; §1.4: 1, 6, 7
Oct. 14	§1.5: 3, 5, 6, 9; §1.6: 1, 2, 4, 6; §1.7: 2, 3, 4, 8, 9
Oct. 21	§1.8: 1, 2, 4; §2.1: 1, 2, 3, 4, 9; §2.2: 7, 8
Oct 24	<b>MIDTERM</b>
Oct. 28	§2.3: 4, 7; §2.4: 2; §2.5: 4, 6, 7
Nov 4	§2.6: 5, 7, 8, 9; §2.7: 3, 8, 9; §2.8: 1c, 4, 5
Nov. 10	§2.9: 13, 15, 18; §3.1: 5, 8
Nov. 18	§3.3: 4, 5; §3.4: 5 ; §3.2: 4, 6
Nov. 21	<b>MIDTERM</b>
Dec. 2	§4.1: 1, 5, 6, 7, 8c; §4.2: 2, 3, 4, 7 ; §4.3: 6, 7, 13 §4.4: 7, 13, 14, 15;
Dec 9	§5.1: 2, 7; §5.2: 2, 3, 6; §5.3: 2, 4, 7
Dec. 12	<b>FINAL EXAM</b> 8:30-10:20 a.m. in LOW 105

These assignments are due at the *beginning* of class on the due date. Please write neatly and staple your sheets together.