Math 31AH Fall 2017: Honors Linear Algebra
MWF 2-2:50pm, Peterson 104
Professor D. Rogalski

1. Contact Information

Prof. Rogalski's Office: 5131 AP&M

E-mail: drogalski@ucsd.edu

Class web site: *www.math.ucsd.edu/~drogalsk/31.html*. Check here for announcements, homework assignments, schedule of lectures, and other information.

Office hours: M1-2pm, W 3-4pm in 5131 AP&M

TA: Eric Lybrand

Eric's Office: 6444 AP&M

Section Meeting time: A01: Th. 9-9:50am in 2402 AP&M, A02: Th. 10-10:50am in 2402 AP&M

E-mail: elybrand@ucsd.edu

Office hours: W 12-2pm in 6444 AP&M, overflow in 7218 AP&M; F 10am-12pm in 6444 AP&M, overflow in 5829 AP&M 10am-11am and 7421 AP&M from 11am-12pm

- **Course description**

Math 31AH is the first quarter of UCSD's three-quarter honors multivariable calculus and linear algebra sequence. The main topic of this quarter will be linear algebra.

- **Prerequisite** The formal prerequisite is a score of 5 on the AP Calculus BC exam, or equivalent evidence of excellent performance in a rigorous calculus course covering the theory of calculus in one variable. Some past experience with writing proofs will be helpful, but is not required. Because the course is already full and will not be expanded to more than two sections, the strict prerequisite will not be relaxed. Please come talk to me in person if you have any questions about being admitted to the course.

- **Comparison with other courses**

Each quarter of Math 31 replaces one course in our introductory calculus sequence. Math 31AH replaces Math 18, Math 31BH replaces Math 20C, and Math 31CH replaces Math 20E. In each case, the quarter of Math 31 covers all of the material in the the corresponding introductory course, as well as additional material, but emphasizing proofs and with more difficult homework and exams. If you complete only part of the year of Math 31, you will not need to take the lower division courses corresponding to the parts you did complete. Only if you complete the whole year of Math 31, you will also be considered as having passed out of Math 109 (Mathematical reasoning), which is otherwise a prerequisite for many upper division courses. A grade of B- or better in Math 31AH is needed to continue in Math 31BH, and similarly a grade of at least B- in Math 31BH is needed to continue onto Math 31CH.

The fact that the whole year of Math 31 (3 quarters) replaces what otherwise takes 4 quarters of coursework (Math 18, 20C, 20E, 109) is not in itself a good reason to take Math 31. The demanding nature of this course is only appropriate for those students that are sufficiently motivated and interested in learning more about pure mathematics and what makes it work, and have the time and energy to put into this in their first year at UCSD. Only a small fraction of our mathematics majors take Math 31.

● **Textbook** The textbook will be *Multivariable Mathematics* by Theodore Shifrin. We will use it for the entire year of Math 31. This text has not been used for Math 31 at UCSD before, so there may be fewer used copies around than usual. If you do get a used copy, be aware that some corrections have been made to the most recent June 2017 printing. I will post on our website a list of the known errors in the previous printing.

The book integrates the material on linear algebra and multivariable calculus, but we will separate the topics by quarter so that the first quarter treats only linear algebra. Because of this, the material for the first quarter will be found in several different chapters of the text: Chapter 1, Sections 4.1-4.4, Section 5.5, Section 7.5, and Chapter 9. We will cover most of the material in those chapters and sections. The material in lectures is meant to complement the book, so you are expected to read the book as well as attending lecture.

● **Homework**

There will be two kinds of homework: written and online.

The written homework will consist primarily of proof-oriented problems. It will be assigned weekly and is to be submitted on Fridays **by 4pm** in the homework box for Math 31 in the basement of AP&M, the first one due on Friday October 6. The one lowest written homework score will be dropped. No late homework will be accepted.

The online homework will be calculation-oriented problems. The online problems will be through a system called WeBWork which checks your answers automatically. The online homework will be due Wednesdays at midnight. The web address for online homework is webwork.ucsd.edu, and your login is your UCSD Active Directory password. If you are an extension student without an active directory password, please see me for further instructions.

As with all higher mathematics courses, the most important part of the course is the homework. You cannot prepare for the exams properly without working through the homework carefully and completely. It is important to start homework early and work on it over the week.

While the online homework gives you feedback immediately, the written homework will be graded and given back at the following week's section. Only certain problems will be graded but you are expected to understand all problems. No solutions to the written homework will be provided; you can ask about problems you didn't understand in section or in office hours, or discuss them with a friend until you feel confident that your solution is correct.

Note that handing in a homework solution copied directly or paraphrased from an online source, or from a friend's solution, is academically dishonest. The homework you hand in should reflect your own understanding of the problems.

- **Writing Proofs**

Mathematical writing is still writing, just of a special kind. You should treat your proofs as you would short essays for an English class. In particular, you should write in full sentences, with good grammar, and avoid overuse of mathematical symbols.

Here is my suggested strategy for producing good homework write-up. Once you think you have figured out how to do a problem, first write out a draft solution. Often in the process of doing this, you will realize there may be minor gaps in your idea you have to fix. In the draft solution, you can cross things out, start again, insert paragraphs, etc. Once you are satisfied, you can create a neat, organized write-up of your final solution.

The idea of writing a proof is to convince someone else that what you claim is true really is; understanding why it is true yourself is only part of the process. A wandering, disorganized proof, even if it seems to contain some of the right ideas, cannot be considered correct if the grader cannot follow your argument.

Learning good proof-writing is a gradual process. It may take a while for you to figure out what style of proof we are looking for. Keep in mind the examples from the book, class and section, and use any feedback from the graded homework to improve.

- **Exams**

There will be 2 evening midterms this quarter, on October 25 and November 15 from 7-8:50pm in our usual lecture room Peterson 103. These times were listed when you registered for the course, so that you should have checked if they conflicted with another course or another commitment at that time. Please reverify at this time that you are free for the midterm exams. If you have a serious time conflict you may not be able to take this course. Let me know as soon as possible if you do have a conflict.

The main reason for evening exams is to allow the students a more relaxed test-taking experience with less time pressure than an in-class 50-minute exam.

The final exam is Wednesday December 13 from 3-6pm.

Please bring a blue book to each exam. No books, notes, calculators, phones, or other aids may be used during exams. The final exam will be cumulative.

- **Office Hours**

Both I and your TAs will have several office hours a week where we will be available for your questions. If you need to see one of us and can not make a scheduled office hour, please e-mail one of us to set up an appointment.

• Grading

Your final average will be calculated using the following grading scheme: Online Homework 10%, Written Homework 20%, Midterm 1 15%, Midterm 2 15%, Final Exam 40%.

Your final grade will be *at least as good* as the grade given by the following standard scale:

97	93	90	87	83	80	77	73	70	60
A+	A	A-	B+	B	B-	C+	C	C-	D

The actual grading scale will likely be more generous than this (that is, "curved"), with the average grade usually somewhere in the B range.

• Collaboration and Academic Honesty

You are welcome to discuss the written homework problems with other students. The write-up you hand in should be your work alone in your own words, however, and should be written while you are by yourself. While it is also OK to seek hints from classmates that have figured out problems on which you are stuck, you will learn the most if you think about these problems hard on your own first and don't give up too quickly.

As mentioned above, copying or paraphrasing the finished writeup of a homework problem in whole or in part from a classmate or from any other source such as the internet, and then handing it in as your own work, constitutes academic dishonesty. As usual, copying from or talking with a classmate during an exam, or using books, notes, calculators, phones or any other aids during an exam is also dishonest and is not allowed.