Math 109 Winter 2015: Mathematical Reasoning
MWF 11-11:50pm, Peterson 104
Professor D. Rogalski

1. Contact Information

Prof. Rogalski's Office: 5131 AP&M

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Class web site: *www.math.ucsd.edu/~drogalsk/109.html*. Check here for announcements, homework assignments, schedule of lectures, and other information.

Office hours: M 12-1pm, W 3-4pm

Section Leader 1: Scott Fernandez (6436 AP&M)

E-mail: saf003@ucsd.edu

Meeting Time: Tu 6-6:50pm, 5402 AP&M

Office hours: Tu 4-5pm, Th 12:30-1:30pm

Section Leader 2: Jay Cummings (6321 AP&M)

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Meeting Time: Tu 7-7:50pm, 5402 AP&M

Office hours: M 2-3pm, Th 10-11am

• Course description

Math 109 is intended to prepare you for the upper-division math courses required of math majors. In it, you will learn basic concepts including properties of integers, set theory, functions, and counting. You will also learn techniques and conventions for writing proofs in higher mathematics. Learning to write good proofs does not happen overnight, or even in a single quarter, and you may find it frustrating at first. By the end of the course, the goal is for you to achieve a basic facility with proof writing, which you can then build on and improve in subsequent courses.

• Prerequisites

The prerequisite is either Math 20F or Math 31AH. However, for most students Math 20A-20C suffices. The most important prerequisite is an interest in abstract mathematics and a willingness to work hard. If you want to take this course and do not have the prerequisite, come see me.

• Waitlist

Adds, drops, and waitlists are now handled automatically online. Any questions should be addressed to the math department staff on the 7th floor of AP&M. In particular, I am not primarily in charge of who does or does not get into the course. As of now the lecture of 109 given by Sorensen, which is held at the same time as this one, has plenty of space, whereas this lecture is full. So anyone on the waitlist for this course is advised to enroll in Sorensen's lecture instead. Also, keep in mind that Math 109 is offered every quarter.

• **Textbook**

The textbook is *An introduction to Mathematical Reasoning* by Peter J. Eccles. The lectures will not always match the book exactly in terms of the order of topics, and occasionally I will use different notation from the book, though I will point out any differences. With material at this level, it is very helpful for you to see difficult concepts (at least) twice, once in class and once in your reading. Sometimes I may also omit from the lectures some less important details or proofs and leave it to you to learn them from your reading. Thus I think it is crucial that you both attend lecture and read the book. The book was chosen partially because it is a softcover and its price is reasonable compared to other textbooks, so I strongly recommend that you buy a copy.

We will cover much of the text during the quarter, but will omit some material here and there. The website will have a tentative calendar showing what we plan to cover when.

• **Homework**

Homework will be assigned weekly and is to be submitted on Fridays by **3pm** in the dropbox corresponding to your enrolled section in the basement of AP&M. The lowest two homework scores will be dropped. Because of this liberal grading policy, no late homework will be accepted. Thus if a short illness or other commitment causes you to miss one or two homeworks, it is not a problem. It is not acceptable to e-mail a copy of your homework to the TA. All homework that is to be graded must be submitted in the dropbox.

The most important part of the course is the homework, and in my experience students that do little or no homework fail the course, as it is not possible to prepare for the exams properly without working through the homework. You cannot truly learn how to write proofs just by watching others, but have to practice doing it yourself. Along with more straightforward problems designed to solidify the basic definitions and concepts, the homework will contain some problems which I expect you to find difficult and are meant to challenge you. Note that solution sets to homework problems will not be provided. It is your responsibility to come to some understanding of any problems you don't solve before the homework is due by asking about them in section or in office hours, or discussing them with friends.

The book does have useful problem sections at the end of each chapter which contain more straightforward problems. You should work through as many of these problems as possible, as you read the text. The solutions to these problems are in the back of the text, so you can use these as a check on your understanding.

I believe the exercises in this course will demand more creative thinking than the typical exercise in a more computationally-oriented lower division course. Creative mathematical thinking often unfolds over time, with new insights emerging the second time or third time you think about a difficult problem. For this reason it is crucial to start homework early and work on it over the week, and not begin it the day before it is due.

• **Writing Proofs**

Mathematical writing is still writing, just of a special kind. You should treat your proofs as you would very 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, will not receive credit if the grader cannot follow your argument. Because improving your proof writing is such a major part of the course, looking over the comments on your homework provided by the grader is very important to help you figure out what needs improvement.

• **Exams**

There will be 2 in-class midterms: on Wednesday January 28 (week 4) and Wednesday February 25 (week 8). The final exam will be Monday March 16 from 11:30am-2:30pm. Please bring your own bluebook 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 TA will have several office hours a week where we will be available for your questions. These will be announced later and posted on the website. If on an occasional basis 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 whichever of the following two grading schemes gives you the higher average: Homework 20%, Midterm 1 20%, Midterm 2 20%, Final Exam 40%, or Homework 20%, best of the 2 midterms 20%, Final Exam 60%. Because of this policy there will be no makeup midterms; if you miss a midterm for any reason, the second grading scheme will automatically kick in. 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 final grading scale will likely be curved depending on the class average. The average grade in the course is usually some kind of B.

• **Collaboration and Academic Honesty**

You are welcome to discuss the homework problems with other students at the stage when you are still formulating ideas. This may be especially useful if, for example, you are confused about definitions or what the problem is asking. 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.

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 are also not allowed. I will not hesitate to bring charges of academic dishonesty if necessary in such cases.