INSTRUCTOR
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Office Hours: 1:30–2:20pm, MWF, or by appointment.

TEXT
Principles of Mathematical Analysis, by Walter Rudin

MATERIAL COVERED
We'll finish Chapter 4, beginning with 4.24. After that, we'll continue Rudin – with some additional material on the Riemann Integral. But since Chapter 9 is a "must be done" chapter, we will probably skip over Riemann-Stieltjes integrals until after we cover Chapter 9. Chapter 11 will not be covered. This semester has some material that is much deeper than that in the first semester, as well as some that is shallower. We will have to go somewhat faster, so you need to read ahead, and avoid getting behind! This semester, come to lots of office hours, and ask questions by email

We need to cover about six pages, on average, for each "lecture" session (there will be some overlapping!). Our speed will depend on your need to ask extra questions, see more examples, or fewer. What you'll be asked to read "for next time" will be adjusted constantly. Tentative reading for the next week will be given each "Friday." The reading for the first 4 lectures is Chapter 4, 4.24 to end, and the first part of Chapter 5. Be sure to read all the Exercises, and read at least 4 new pages before each lecture, whether they are to be covered or not. You will probably have to make *many* readings of each page!

GRADING

There will be Homework, Special Problems, 2 Tests, and a Final Exam. *Tentative* **test dates** are February 17 and April 7. Each Test may involve material covered in lecture up to the Test. Thus, you are responsible for material covered in the lectures!

Your grade in this course will reflect what you did in it, not your ability or potential. It is very important, then, for you to be able to put your work on paper, under time pressure. If you have problems taking tests, there are people on campus who might be able to help you overcome them. Ask about it at an office hour!

You'll have a GPA grade for each Test, your homework, the Special Problems and the Final. The weighting of the grades, though subject to change, is, at present: 12% for each Test, 21% for homework, 21% for Special Problems, and 34% for the Final. Grades will perhaps amount to 80-85% for A, 65-70% for B, 50-55% for C, 40-45% for D. By following the description below, you can "track" your grade as the course progresses.

Each grading item will have "Gradelines" assigned to it. For example, if the B gradeline is 70, the A gradeline is 85, and your score is 80, then your GPA grade, G, for that item is $G := 3 + \frac{80-70}{85-70}$ "=" 3.67. Here, (G is rounded to 2 places after "."). In other words, your GPA grade is a B plus $2/3$ of the way between B and A. Your GPA grade, G, on *any* grading item is computed using your score on it, and numbers g (the grade corresponding to the highest gradeline smaller or equal to your score), glb (the highest gradeline smaller or equal to your score), gla (the lowest gradeline greater than your score):

$$G = g + \frac{\text{your score} \quad - glb}{gla - glb},$$

where glb is the gradeline just below your score, gla is the next gradeline - above your score and g is the grade number: 5 for a 100% score, 4 for the A gradeline, 3 for B, etc. If your score falls on a gradeline, then $G = g$. If your score is 100% on a Test, your $G = 5$.
When the G's are combined with their weights and added, the total is your GPA grade for the course. If that total is within 0.05 of $n+1+(m/3)$ (where m and n are in $\mathbb{N}$) your grade is "borderline." Case-by-case decisions are made, in borderline cases, whether to award the higher or the lower grade. An important factor then is the direction your grades have taken at course's end!

Be sure to talk to me in advance if you have to miss a Test! If you do and you don't make arrangements in advance, your G for that Test is zero!

If, for documented reasons beyond your control, you're passing and you can't complete the course, the grade you have up to that point "stays with you" as part of an Incomplete; all I's must be issued according to department guidelines.

Scholastic Conduct
Please read the (appropriate for you) notices in the IT Bulletin, the CLA Bulletin, and so on. You are encouraged to work with others in understanding what problems say, setting up solutions, and so on, but you must submit as YOUR work only what YOU have written up yourself. If you get ideas from a reference or from someone else, GIVE CREDIT! Do not simply copy another person's work. Graders will be asked to bring answers that look alike to my attention. When I see such an answer, I give a score of zero.

What is the course all about? A reminder!
First of all, Math 5616H is *proof oriented.* This means that the lectures consist of Definitions, Theorems, Proofs, Examples, Questions (for you to answer then and there), and your questions too. These courses are also "graduate-study preparation courses." In some disciplines outside mathematics this material is prerequisite.

The homework, Tests, and Special Problems all involve *proving* some *mathematical* statement. Sometimes these proofs are routine or tedious or even tough exercises in making appropriate changes in material from the text or lectures. For examples, see Exercises 1–5 of Chapter 1. Many, however, are demanding – they require you to think deeply and call up all your resources of imagination and creativity. Examples may be Exercises 6, 7, and 19 in Chapter 1. These are the ones that are rewarding!

The additional material on Riemann integrals has to do with the question: *Exactly* which functions are Riemann integrable? You probably already know that piecewise continuous functions are Riemann integrable, and it is fairly easy to show that functions that are bounded and monotone on a bounded interval are Riemann integrable there. It is much harder to show that the answer is: f is Riemann integrable on a bounded closed interval $[a, b]$ if and only if f is bounded and continuous "almost everywhere," which means that the set of points in $[a, b]$ where f is *not* continuous is a *set of Lebesgue measure zero.* This last means that, given any $\epsilon > 0$ there exists a covering of the set by an at most countable collection of open intervals whose lengths add to less than ϵ. Since any finite set is a set of Lebesgue measure zero (or, a *null set*), piecewise continuous functions are Riemann integrable on bounded closed intervals. You also know that the set of discontinuities of a monotone function is at most countable. It is fairly easy to show that a countable set is a null set. Thus the "usual" cases are covered by the theorem.

This is enough introduction for now. The material in this text is seldom referred to in mathematics journals. It is in a way testimony to its excellence that it is known to working mathematicians as "baby Rudin." Everyone who might read an advanced mathematics paper on any subject that uses Analysis is expected to know what is in here! There are several excellent texts by Professor Rudin. This one is regarded with great affection.