The Attack Plan

Unlike many mathematics courses that you may have taken in the past, we will not be relying on the text to see us through the material; this is due to the fact that all texts currently available have significant enough shortcomings that they are not worth their price for this course. Every piece of information that you will be required to learn in this course will be presented, in full, during class, online, and/or in handouts throughout the term. Below are some notes on the details.

Definitions and proof: This course is likely the first college-level course you've had in which mathematical *proof* plays a significant role. To put it simply, we're not content merely to be able to perform computations, nor to have just an intuitive grasp on the concepts we'll be studying—we'll insist on strictly defining all that we study and establishing exactly *why* each key fact is true (in the form of proofs).

You should view this aspect of the course not as a fearsome or arduous task, but a unique opportunity to gain mathematical clarity in your thought process and to learn a skill of true intellectual significance. Mathematical proofs are clear and complete—more so than any other human intellectual product—and this endows them with a singular, if at first subtle, beauty. Once you've learned to correctly focus your thinking, you'll find that the proofs in this course (as well as the rest of the material) are very intuitive and not all that difficult—an underlying goal of this course is for us to cross this threshold into a way of thinking that breaks through all that makes mathematics seem "hard," allowing us to perceive its simple beauty and work in concert with it.

A quick word on definitions: proof is impossible without precise definitions. Your task as a student is very straightforward as concerns definitions: each definition must be memorized *precisely*. "Understanding" is a nebulous concept, but precise definitions (as well as examples) provide a solid foundation from which to build it. Definitions will be the starting and ending points for nearly every proof that you write in your mathematical career, and knowing definitions well will make an immense difference in your ability to write proofs.

Thought process: Practice ***observing your own thought process*** as you go through this course, particularly when you're thinking through a question or problem. This is arguably the most important aspect of mathematical proficiency, alongside memorization of the key definitions and careful study of logical relationships. Each discussion we have, each problem presented to you, is there to either to help establish (or to check your grasp of) some facts, relationships, and/or thought processes. A correct answer to a question is ***not*** what you're after—rather, it's the *result* of the mental skills that you are learning. The more you refine your mental process, the easier mathematics will become (and it can, indeed, become *very* easy if you hone your skills). The most fundamental skill that you should be learning in any course is how to properly *perceive* and *think about* the subject at hand; keep this in mind throughout this term and in the rest of your academic career.

Class meetings: Show up in mind as well as body. Follow along mentally, reason things through yourself, and ask questions when you have them. Think. Think, think, think! Don't just sit back and watch…

As far as ***class notes***: don't overdo it with them. It's difficult to think and write at the same time, and you can guess from the above paragraph which one I'd rather you did. Treat your note-taking as you would a highlighter when reading a book—write down only the key ideas and observations, don't just blindly write down everything I say and write. The point of class meetings is to think, consider, and ***ask questions***. If you approach the learning process correctly, your time spent in class will be far more valuable than time spent reading through a book, because it is an *interactive process* that you can help mold to your needs.

Homework is an essential tool for learning the material, as well as your first gauge of your understanding of the material. Take the correct approach to homework: your goal in doing a homework assignment should *not* be simply to get it finished as quickly as possible, but instead to take whatever time is necessary to work through all of the problems until you really understand how they should be thought through.

As far as using your notes and solutions when doing homework: *don't misuse them*. What does this mean? Make sure that whatever you need to know to do a problem sticks around in your head long enough for you to get a chance to remember it. If the process runs as:

confused by problem → look up the answer → done with problem,

all in the span of a minute, then you've (unfortunately) run a successful brain-bypass. Sure, the homework problem goes smoothly—the only problem is that you usually don't learn whatever it was that you needed to. *Work at your own pace*, and know what you've done after you've done it—understand every nuance of each problem that you work. Take a little more time to think an issue through if it isn't immediately clear. This time spent thinking through topics for yourself is the most valuable time that you can spend when studying mathematics, so don't avoid it or bypass it in a rush to be "finished"—this *time of contemplation* is where most learning happens.

I strongly suggest looking over the material before you start your homework (almost like studying for a quiz), then trying first to do the problems *without* any outside materials. If all goes smoothly with the problems, then you're well on your way to a good basic understanding of the material. But keep a blank piece of paper nearby, and if you ever do need to look anything up, copy down that "missing" fact, idea, or principle; this assures that you pick up on whatever it is that you were missing in terms of understanding—and it will be useful when you study the material again. Be sure, once you've completed a homework assignment, that you understand what's going on and would be prepared to think through similar problems if they came up again.

Finally, concerning working together on the homework, I strongly suggest it; it makes the work both more enjoyable and more profitable. The same warning applies as above, however: don't immediately ask for help if something difficult comes up, and be sure to write down on a sheet of paper any help that you get from your friends—because in the end it's ***you*** who must understand the material and know how to do the problems.

Quizzes will be extremely short, primarily addressing definitions and examples, with occasional problems on basic concepts and methods. They will occur unannounced from time to time, just to give you that little nudge (that we all need) to keep up with the material and pay close attention to your homework—if you do so, you won't need to worry about the quizzes.

Examinations: There will be three evening exams during the term, each covering a segment of the course material. At the end of the term, there will be a comprehensive final exam, lasting three hours, as scheduled by the registrar.

Out-of-class discussion: Do it! Honestly. You'll learn the material better, and in the process, you'll get to know your classmates a little better too.

Office hours are any time I'm free. And I won't be hiding…I want you to learn this material. If *you* want you to learn the material, too, then put in the time and effort it takes to do so. My officially posted office hours are at the top of the page, but I'll be happy to talk with you almost any time or place, unless I have a previous commitment.

> There is no reason that you should come away from any topic we cover without fully understanding it, if you carefully review your notes, work observantly on your assignments, and come to office hours to clear up any material with which you're not yet comfortable.