MATH 1441G: Calculus 1

Text: *Calculus, 7^{th} edition*, by James Stewart (Thompson, Brooks/Cole)

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You are welcome to drop in or make appointments at times other than my office hours; however, please do not knock on my door when it is latched, as I am engaged in research (or perhaps on the phone) and don't want to be disturbed. I will leave the door ajar when interruptions are welcome (which is most of the time.) Thanks!

Please do not hesitate to seek individual help from me. Do not wait until you are behind. Do not put it off, thinking you should figure more things out before you come see me. I love working with students, and doing so is an important part of my job.

1. Course Content

Limits, continuity, differentiation and integration of functions of one variable, the fundamental theorem of calculus, applications. These topics are covered in chapters 1-5 of the text.

2. Objectives

The primary objective of this course is that you truly understand the principle concepts of calculus and its applications. The word *understand* is quite vague, so let me explain what I mean: **you understand a concept when you can explain it in your own words and can apply it to solving problems** *that do not follow the exact pattern* **of those you have previously been given as examples.**

More specifically, the following objectives outline the approach we will take to the topics of the course.

- You will be able to apply the concept of a *limit* to interpret and define a variety of mathematical and physical ideas, such as the "instantaneous" rate of change or the area under a curve.
- You will be able to use the formal definition of a limit to compute and verify limits. Furthermore, you will be able to explain how the construction of functions from simpler ones, using both arithmetic operations and composition, leads from the formal definition to very efficient rules for computing limits. You will be able to apply these rules and to derive many of them.
- You will be able to define the concepts of derivative and definite integral as special types of limits and use the properties of limits to derive rules for computing derivatives and integrals. You will be able to apply those rules accurately in performing calculations.
- You will be able to solve a variety of applied problems involving rates of change (differentiation) and variable accumulation (integration).
- In general, you will be able to state and apply each definition covered in the course, as well as any terms or notations used in the definitions.
- You will be able to state and apply each theorem covered in the course. For each theorem, you will be able to explain the reasoning used to establish it (although you will not be responsible for formal proofs.)
- In particular, you will be able to explain the relationship between differentiation and integration given by the Fundamental Theorem of Calculus, explain and apply the method of substitution to compute antiderivatives, and apply the Fundamental Theorem to evaluating definite integrals.

3. How to Read the Textbook and Do the Homework: Some Suggestions

Read each section two or more times with increasing attention to detail. On the first reading, ascertain the main concepts covered by the section, particularly definitions and theorems, and examine the diagrams. You will get much more out of class if you do this reading *before* the class in which the topics will be covered. On the second reading, be careful and thorough; however, it is not necessary to read every word. Study the main ideas and techniques, and don't waste time with material you have already understood from studying your class notes. Reread any sections that require further study as needed.

Try to visualize the ideas for yourself as you read. Make comparisons and analogies to things that are familiar, and think about how the new ideas relate to what you have already learned. Mathematics is difficult to read! Avoid getting bogged down in a swamp of technical details! *The trick is to recognize that the technical details are motivated by simple basic ideas; get a sense of these ideas before verifying the technical details, in order to place them in context.*

When you read the examples, *don't try to memorize the procedure that is used*; instead, *think about the purpose of each step*, and *also think about the overall strategy that motivates the steps and binds them together*

in a logical sequence, so that you will understand how to do new problems. Only after doing this should you attempt the homework problems!

4. How to Participate in Class: Some Suggestions

Many people find that note-taking focusses their attention, but do not let note-taking distract you from thinking about the material being presented. It is not necessary to get everything down. All of the essential material is in the textbook and prepared overhead slides (which I will post); if you have read the section in advance, you will know what additional pointers you might want to write down. In taking down an example, it is not necessary to write down every algebraic step; leave room so you can fill them in later.

Always go over your notes before the following class, filling in any missing details, adding marginal notes, and making sure you understand what you have written. If you have questions, ask them at the beginning of the following class. (I will usually ask for questions at the beginning, but if I forget to do that, ask your questions anyway!) Be neat, organized, and thorough - it really helps a lot!

Finally, *never hesitate to ask a question in class. You would not be taking calculus if you were stupid; therefore, if you don't understand something, your question is not stupid! There is no such thing as a stupid question! Rather, it is foolish not to ask the question! (And when you do ask it, you will be doing a favor for students shyer than yourself who wanted to ask the same question!)*

5. Requirements & Grading

5.1. **Homework.** Homework will regularly be assigned and graded with comments and corrections. Needless to say, it is important to read the comments and corrections! (Generally, only a representative portion of the assigned problems will be graded, but you need to do them all in order to learn the material.) Unannounced quizzes will be given periodically. These are designed to assess how well you have learned from the homework and to help prepare you for the exams.

I encourage you to work in groups and discuss the homework problems with your classmates. Cooperation is far more effective than slogging it out on your own. Also, the experience of explaining things to other people and finding their mistakes will improve your own understanding. *I strongly advise forming a study group of 2-6 people that meets regularly to work on this course. Gobs of research shows that students who belong to a regular study group do better than those who don't.* (It stands to reason, doesn't it?)

You may submit joint homework papers with up to three authors. All authors must be given credit and accept the same score. It is up to you to ensure that all authors have contributed substantively and deserve credit! *Don't divide up the problems: work on them together until you all understand and are satisfied with every solution!* You all need to be able to do the quizzes and exams!

5.2. **Exams.** There will be four exams during the term and a final exam, each worth 100 points. Exams during the term will be scheduled at least a week in advance at appropriate times and cover the following material:

- **Exam 1** will cover Chapter 1.
- **Exam 2** will cover Chapter 2.
- **Exam 3** will cover Chapter 3.
- **Exam 4** will cover Chapters 4 and 5.
- **The Final Exam** will be *comprehensive*.

Make-up exams will be given only under extraordinary circumstances or in case of serious emergency; prior permission to miss an exam must be obtained from the professor if at all possible.

5.3. **Grading.** I will drop your lowest exam, not including the final, leaving a total of **500 points: 100 for your homework percentage, 300 for exams during the term, 100 for the final exam.**

Solutions to exam questions must be clearly presented and justified in order to receive credit. You must show the method by which you did the problem. I am VERY STINGY with partial credit.(However, I am forgiving about small careless errors.)

I do not grade on a "curve"; an average of at least 90% (450 points) is required for an A, at least 80% (400 points) for a B, and so on. Thus, your grade will not depend on how how your fellow students do. If you do a good job of learning the material, you will receive a good grade, regardless of how well the other members of the class perform. Don't forget that the reverse is also true: if you do a poor job of learning the material, you will receive a poor grade, regardless of how poorly everyone else does.

Complete honesty on assignments and exams is expected.