Analysis

Math 104, UC Berkeley Summer Session 2015

Course content

This is a first course in analysis. The goals of this course are the following.

- Understanding some of the theoretical foundations underlying calculus.

- Developing skills in rigorous mathematical reasoning and proof-writing.

Officially, the prerequisites for the course are Math 53 and 54. Practically, you will only need to have taken Math 1A or some equivalent thereof. You may also find it useful to have taken a course like Math 55, but this isn't essential. You won't be required to own any particular textbook. However, the following may be useful references.

- Kenneth A. Ross, *Elementary Analysis: The Theory of Calculus.*

- Walter Rudin, *Principles of Mathematical Analysis.*

Homework

I will post a problem set online every week except the last (for a total of 7 sets). You may submit solutions as many of these problems as you would like. Submissions will be collected on Thursdays and passed on to a grader. I will not be able to accept late submissions, so if you know in advance that you will not be able to make it to class on Thursday, you should submit them to me sooner.

The grader will mark each solution you submit as either *complete* or *incomplete.* In order to be marked complete, your solution must be both mathematically correct and clearly explained. This means, in particular, that you must fully prove all assertions you make (you may cite theorems from the above reference texts, but be very clear about which theorem you are using and why all hypotheses of the theorem are satisfied). Furthermore, complete sentences in English are required: a series of symbols without further explanation will immediately be deemed incomplete. There may not be much in the way of comments explaining why a particular solution was marked incomplete. It is your job to analyze your own solution for mistakes. If you find yourself struggling with this, I will be happy to help you during office hours.

After your submissions are returned to you, you may revise any of your solutions which were marked incomplete. You can submit a physical copy of the revisions to me at any time. If you choose to do this, you must attach a copy of your old incomplete solution, and you must write up your revisions anew (in other words, don't scrawl in between the lines of your old incomplete

solutions). I will read your revised solutions, and if they meet expectations, I will mark them complete, overriding the original incomplete designation. If your revised solution still does not meet expectations, you will not have another opportunity to revise.

Each problem on problem sets will be assigned some number of points based on my perception of the difficulty of the problem. When you complete a problem worth m points, you will be awarded points according to the following rules.

- If you complete the problem on the original submission, you will receive all m of the points for that problem.

- If you complete the problem on a revision, and your revision was submitted n days after the day when the original incomplete solution was returned, you will receieve

$$\max\{0, m - \lfloor (n-1)/7 \rfloor\}$$

  points. In other words, you can receive full points on your revision if you submit it within a week after your original incomplete solution is returned to you. After that, the number of points you can receieve for completing the problem will decrease by 1 point every week. When this number gets to 0, it stops decreasing.

Incomplete solutions will receive no points.

Note. At some point, there will be a deadline after which I will no longer accept revisions so that I have enough time to read all submitted revisions before I must submit grades. I will announce this deadline later, but it will be approximately one week prior to the end of the course.

Final

There will be a cumulative take-home final exam. The exam will be posted online on Monday, August 10, and you must submit a physical copy of your solutions to me before the end of class on Thursday, August 13. Due to time constraints, you will not have an opportunity to revise your solutions to problems on the final.

Like homework problems, problems on the final will also be assigned some number of points depending on my perception of their difficulty. Since you will not have an opportunity to revise your solutions for the final exam, I may award some partial credit for solutions which may be technically incomplete but still indicate substantial progress.

Grading

Grades will be determined based on the number of points you accumulate. The following table summarizes the basic point requirements for receiving particular letter grades.

Grade	Points
C	40
C+	54
B-	68
B	82
B+	96
A-	110
A	124

In addition to the above point totals, I will also consider the following when determining your final letter grade.

- To receive an A, you must complete at least 1 challenging problem (that is, one that is originally worth at least 2 points) from each problem set as well as the final. Note that a problem counts as complete even if you receive 0 points for it because you submitted your revision late in the semester!

- You must attempt the final exam in order to receive a passing grade.

- Your grade will be decreased by a unit (for example, from a B to a B-, or from an A- to a B+...) if there are any problem sets from which you have completed no problems.

Note. I may make this grading scheme more lenient, but won't make it any harsher.

Miscellaneous

There are ways of making the learning process more fun, and ways of making it less fun. I'm hoping that all of you help me in keeping this class as fun as possible.

- Collaborating with each other is a great way of making the learning process more fun. You'll learn a lot from each other by thinking about how your approaches to particular problems differ, or what the mistakes of one approach are. And you'll make friends in the process!

- Copying each others' solutions verbatim is a great way of making the learning process less fun: you won't learn anything from it, I'll be forced to report cheating, university administration will have to get involved, and university administration involvement is sure to be a big fun-sucking black hole.

- Looking up general concepts on the internet (on Wikipedia, for example) is also a lot of fun. You'll introduce yourself to a lot of other related concepts in the process, and this will help consolidate your understanding. For example, you might discover that there are some more general concepts which make the intuition clearer, or you might find some interesting applications, or you might encounter some weird pathological counterexamples... The possibilities are endless!

- Looking up solutions to specific problems on the internet and copying them verbatim is not fun. Again, you won't learn anything from doing this. It also constitutes plagiarism, so the fun-sucking university administration will have to get involved...