Math 181 Handout 0

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Welcome to Math 181. This is a class devoted to surfaces and their structure, designed for undergraduates who are very interested in math. The purpose of this handout is to introduce you to the course.

1 When and Where

Currently the class meets T-Th, 2:30-3:50, in Kassar 205. There is some possibility I'll change the time, depending on the preferences and schedules of people who want to take the class.

2 Rough Syllabus

My plan is to tell you about a lot of cool things I've learned about surfaces over the years. Here is a rough list of the topics I want to cover:

- Definition of a surface, and some basic topology of metric spaces.
- The fundamental group; covering surfaces; topological classification.
- Elementary complex analysis and Riemann surfaces.
- Non-euclidean geometry, hyperbolic surfaces, and uniformization.
- Flat singular surfaces and billiards.
- Polyhedral surfaces, rigidity, and flexibility.
- Moduli spaces of surfaces. Teichmuller space.

All of this material can be found in various textbooks, though there probably isn't one textbook that has it all. For the first half of the class (at least) I plan to lecture mainly from notes I write up myself. This will give me a lot of flexibility in presenting material and designing good homework problems. Whenever possible, I will point out textbooks or other sources where you can read more about what I'm talking about in class.

Right now, I am planning to aim the class at fairly advanced undergraduates. You should be perfectly well prepared for the intended version of the class if you have had:

- 1 semester real analysis;
- 1 semester abstract algebra;
- 1 semester complex analysis.

if you've just had the first two items, you should still be OK, as I will present the needed complex analysis basically from scratch.

I will of course modify the class to suit the people who actually want to take it. So, you should definitely let me know where you stand.

3 The Structure of the Handouts

I plan to write up notes each week, and then base the week's lectures on the notes. The notes will probably be $5 - 10$ pages, with around 10 exercises embedded in the text. Most of the exercises will be fairly routine, but I'll put a few challenging problems in each batch. Depending on how things go, I might make the exercises easier or harder.

It should be possible for you to understand the notes without working the exercises, but you will get a lot more out of the notes if you do work the exercises. Also, your grade in the class is based entirely on your work on the exercises.

I welcome your feedback on the notes. They are designed for you, so you should certainly let me know if you like the format or would prefer to see it changed.

4 Grading

As I said, your grade in the class is based entirely on homework. I'll expect you to turn in roughly half the problems you encounter in the notes. This will probably come to about 5 problems per week. I'll divide the homework into two categories, *regular* and *challange*. I'd like you to work on the regular problems yourselves. You can work on the challenge problems together. Over the semester, I would like you to turn in at least 5 challenge problems. (Don't worry; they won't all be killers.)

What constitutes "regular" and what constitutes "challenge" will depend a lot on how things go in the course.

5 Office Hours

I plan to be around campus mainly T-W-Th. In class we'll take a vote on a good time for office hours.

I would definitely encourage you to come to office hours. I'm a friendly guy and like talking to students. Also, this is the only class I'm teaching this semester, so I have some free time.

6 About Me

I'm a professor in the math department. This is my first semester teaching here. Previously I was a professor at the University of Maryland. I came here because I thought that it was a good time for a change, and Brown University really appealed to me.

My research interests are in geometry and topology, and also dynamics. I like to work on simple problems for which there is little existing machinery. Even though my research lies in pure math, I think of myself mainly as a mathematical experimentalist. I like to run mathematical computer experiments to find out what is true, and then try to give rigorous proofs for what I see.

My website is www.math.brown.edu/∼res