Real Analysis I
Review for First Exam

The first exam is on the material covered in class up to last week, which corresponds roughly to sections 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, and 3.1 of the text, and to the first three assignments.

1.4 Most of the material in this section, concerning open sets, closed sets, and compact sets, is review from undergraduate analysis, so I did not spend much time on it in class. We do use this material all the time, though, so if you are not too familiar with it you should brush up on it. (The same goes for the material on continuous functions on pages 25 to 27.) We did cover carefully in class the material on pages 19 and 20 about σ-algebras.

2.1, 2.2, 2.3, 2.4, 2.5 Section 2.1 is just an introductory section, with a few problems on σ-algebras at the end that were on Assignment 1. Sections 2.2, 2.3, 2.4, and 2.5 we covered in detail, with not much deviation from the text. We did not discuss the Borel-Cantelli Lemma (page 46) in class, and it won't be covered on the exam.

2.6 I proved the existence of a non-measurable set in class, but using a somewhat different argument than the one given in this section, and I did not obtain the full result stated in Theorem 17. You won't need to know the details of the proof of existence of nonmeasurable set for the exam. It is enough to know the statement of Theorem 17.

2.7 I went through most or all of this section in class, although not all at once. I discussed the Cantor set first, and the Cantor-Lebesgue function a few days later. This set and this function are referred to a lot in the subject, as they are useful for constructing examples, so you should be pretty familiar with them.

3.1 We went through the entire section in class, though I did not use exactly the same arguments as those given in the book.

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It's obviously a good idea to try to do problems from the ends of these sections as practice problems.

It's also generally a good idea to find some other real analysis text you like besides our text, and keep studying from it as well as from our text as we go through the semester, to see what the subject looks like from a different viewpoint. I would not recommend trying to consult more than two texts, as that gets confusing. It's better to become quite familiar with just two texts than to only have superficial familiarity with several of them. You might try from among the following: "Measure and Integral" by Wheeden and Zygmund, the third edition of Royden's "Real Analysis", "Real Analysis" by Stein and Shakarchi, "Real Analysis" by Gerald Folland. I haven't read the last two myself, but I've heard they're good. I also like "Analysis" by Lieb and Loss, but maybe that's more like a second-year analysis book. It wouldn't hurt to take a look at it anyway.