Math 5310. Fall 2014. Information about the final exam.

The final exam will be given on Tuesday, December 16th, 9am-12pm in our regular classroom (Monroe 118). It will contain 6 or 7 problems, one of which will be a bonus problem. The exam will cover material from Lectures 4-25 (it will not include Dedekind cuts and the topics discussed in the last two classes). The main reference for the material on measure theory is Sections 25,28 and 29 of Kolmogorov-Fomin (KF); in addition I strongly recommend reading Rudin's section on measurable functions (pp. 310-313) – note that some of the definitions in Rudin (e.g. the definitions of simple functions and Lebesque integral are different from those given in class and KF, but this does not affect the measurable functions section).

The exam will definitely contain at least one problem on each of the following topics: compactness, Arzela-Ascoli Theorem, Stone-Weierstrass theorem, measurable sets/measurable functions. The bonus problem will be related to the Cantor staircase function (see HW#10.3 and Midterm 2.2). One of the problems will ask for a proof of one of the following theorems:

1. Compactness implies sequential compactness (Proposition 7.2 from class).
2. Closed intervals in $\mathbb{R}$ are compact (Theorem 8.3 from class = Theorem 2.40 from Rudin, except that the latter also treats higher-dimensional case)
3. A uniformly convergent sequence of continuous functions converges to a continuous function (Theorem 14.2 from class; also a very similar result is proved in HW#7.3)
4. Construction of a continuous nowhere differentiable function (Lecture 16, Theorem 7.18 in Rudin)
5. A pointwise bounded sequence of functions on a countable set has a pointwise convergent subsequence (Lemma 17.1 from class = Theorem 7.23 from Rudin)
6. Arzela-Ascoli Theorem (Lecture 18, also see Theorem 7.25(b) from Rudin)

Make sure you know (precise formulations of) all the main definitions - some of the exam questions may ask for those.