MATHEMATICS 501

Theory of Functions of a Real Variable, 1st Semester

Fall 1999 — Inst.: B. Walsh

This offering will start the standard year graduate sequence in real-variable theory. The textbook will be the rather classical one of Richard L. Wheeden and Antoni Zygmund, *Measure and Integral: An Introduction to Real Analysis*, Marcel Dekker, ISBN #0-8247-6499-4.

It seems a reasonable ambition to cover the first nine chapters of this textbook fairly thoroughly. We should also look, however briefly, at the "Carathéodory construction" of measures in a purely-set-theoretic context, but we should probably leave such topics as characterizing the dual of $(\mathcal{C}(X), \| \ \|_\infty)$ for the second semester. (As of this writing I believe that Mr. Wheeden is scheduled to give 502.)

The prerequisites are a good advanced calculus course[1] and that eternal intangible, "mathematical maturity." The ability to write logically correct and linguistically coherent proofs in the language of instruction is essential. Real analysis traditionally aims for best-possible results, so having the imagination that one needs in order to construct counterexamples to plausible extensions of known theorems will also be a big help.

I plan to stick fairly close to the textbook. Additional class materials, if any,[2] and homework assignments (certainly) will be given out in class and posted on a web page (accessible via `Course materials` on the department web page).

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[1] The local courses 640:311 and 640:312 would be marginal, not good, unless the student got nothing but A's, was bored to death while taking them, and read the parts of the textbook that the courses never got around to covering. 640:411 and 640:412 would be just fine, and the student who did well in that sequence may well coast through the early part of 501.

[2] These will probably include, at the minimum, some material on Riemann-Stieltjes integration.