Version 2/6/07

Midterm Coverage for Midterm Thursday, February 15, 2007

Definitions: outer measure on X, the measure generated by an outer measure, the measurable sets with respect to an outer measure, distance between sets, metric outer measures, Hausdorff measures, Hausdorff dimension, σ-finite, $L^p(\mu)$ for $1 \le p \le \infty$, convergence in measure, Cauchy in measure, the spaces l^p_n, l^p, l^p_d, and c_0 as used in the discussion of Fourier series, normed linear space, inner-product space, Banach space, Hilbert space, norm of an operator, dual space, Fourier series, trigonometric polynomial, Dirichlet kernels.

Statements and Proofs: statement of Theorem 2.3, statements and proofs of Propositions 2.6, 2.7, Theorem 2.8, Corollary 2.9 statement of Fatou's Lemma, statement of Fatou's Lemma, statement and proof via Fatou's Lemma of Lebesgue Dominated Convergence Theorem as formulated in the notes, statement and proof of Hölder's inequality and Minkowski's inequality, proof that $L^p(\mu)$ is complete, including statement and proof of Lemma 3.3, statements and proofs of Theorem 3.5 and Theorem 4.4, statement and proof of the Banach Steinhaus Theorem/Uniform Boundedness Principle, statement only of the Open Mapping Theorem, statements and proofs of Lemma 5.1 (Riemann-Lebesgue Lemma) and Theorem 5.3 (you may assume $\int |D_N| \to \infty$), statement and proof of Theorem 5.4, statement and proof of the Cauchy-Schwarz inequality and all the results in the appendix on inner-product and Hilbert spaces up to, but not including, the Riesz Representation Theorem.

Examples: Example of a sequence of functions converging to zero in $L^p(0,1)$, $1 \le p < \infty$, which does not converge a.e. to zero.

Exercises: 3, 10, 11, 12, 13, 14, 15, 17, 18, 19 ((i), (ii), (v)),

Other Stuff: We may pose other problems which should seem reasonable if you know all of the above.

Things added since 2/6/07: none yet.