452 Final Exam Overview and Review

The exam will be in two parts, each two hours. The first part will cover Chapters 1 and 2 and is optional. See the midterm review sheet for details. The second part will cover Chapters 3 and 4 as outlined below.

Section I ($\sim$10%) is just stating definitions, facts and named theorems. By able to define derivative, Taylor polynomial, analytic, Riemann sum, Riemann integral, Darboux integral, anti-derivative, absolute and conditional convergence, bump function, Hölder and Lipschitz conditions, $\mathrm{osc}_x(f)$, uniform convergence, equicontinuity, sup norm, residual subset, generic condition. Know the statements of the MVT, various derivative rules and when they apply, the FTC and its variants, the Riemann-Lebesgue theorem, and any other named theorems. There may be some simple calculations.

Section II ($\sim$50%) will be short proofs. I'll probably list several and ask you to prove three or four of them. Mostly they will be results you have seen, but they might include similar results or minor variations. Examples follow.

Differentiation rules, MVT, Theorem 7 on page 144, Inverse function theorem, the corollaries of the Riemann-Lebesgue theorem, the anti-derivative theorem, integration rules, root and ratio tests, Theorem 1 on page 203, Weierstrass M-test, Heine-Borel theorem for function spaces, Banach contraction principle (contraction mapping theorem), Baire's theorem, any homework problem.

Section III ($\sim$40%) will be a couple of longer proofs of major results. I'll probably list several and ask you to do two. Some possibilities include the following: equivalence of Darboux and Riemann integrability, compute the integral of the "rational ruler function" (done in class), the FTC (not "proof #1'), C_b is a complete metric space, Theorem 6 on page 207, the irrationality of e (done in class), Theorem 9 on page 209, Arzelá-Ascoli theorem, Picard's theorem.