FINAL EXAM TOPICS

The final exam will be cumulative and may include any topics we've covered in lectures, problem sets, or the relevant textbook sections during the semester. Since the second midterm, we've covered most of §3.1 and §3.2 in the textbook by Pugh. Among these, here are some of the main topics you'll want to be comfortable with:

- differentiability (definition, basic properties, L'Hôpital's theorem)
- mean value theorem, extreme value theorem, ratio mean value theorem
- Darboux's theorem (the derivative of a function satisfies the intermediate value property)
- Lipschitz functions
- smoothness classes C^r, functions which are differentiable but not C^1 and so on
- Taylor's approximation theorem
- inverse function theorem
- the Riemann integral (definition, basic properties, examples and counterexamples)
- Darboux integrability, Riemann's integrability criterion
- continuous functions on compact metric spaces are uniformly continuous
- Riemann integrability of continuous functions, monotone functions, indicator functions
- null sets (basic properties, examples)
- Riemann–Lebesgue theorem
- first and second fundamental theorems of calculus
- the Cantor function (aka Devil's staircase)

As with the midterms, you should be comfortable with all of the important definitions, be able to produce examples and counterexamples on demand, and be prepared to write a few short proofs.