Review for Second Exam

The second exam will cover sections 5.4, 7.3, 8.1, and 8.2 of the text. (The relevant assignments are assignments 4 through 7.)

The format of the second exam will be similar to that of the first. Here are the definitions, statements of theorems, and proofs which I might ask for.

- Know the definition of "uniformly continuous" (5.4.1).
- Be able to state the Uniform Continuity Theorem (5.4.3). I will not ask for a proof.
- Know the statement and proof of the Fundamental Theorem of Calculus, part 1 (7.3.1).
- Know the statement and proof of the Fundamental Theorem of Calculus, part 2 (7.3.5).
- Know the statement of Taylor's theorem with integral form of the remainder (7.3.18).
- Know the definition of "uniform convergence" (8.1.4).
- Know the definition of the uniform norm (8.1.7), and the statement of Lemma 8.1.8.
- Be able to prove that the uniform limit of continuous functions is continuous (8.2.2).
- Know the statement of the theorem on the uniform convergence of differentiable functions (8.2.3).
- Know the statement of the theorem which says that if f_n converges uniformly, then $\lim \int_a^b f_n = \int \lim f_n$ (8.2.4).

Here is a more detailed guide to the material in the text that you should review for the exam.

- Section 5.4: from the beginning of the section up through Theorem 5.4.3 and its proof. You can skip the remainder of the section.
- Section 7.3: the entire section is worth reviewing. If you like, you can skip the subsection titled "Lebesgue's integrability criterion", but I'd recommend at least reading the statements of Theorems 7.3.14, 7.3.15, and 7.3.16.
- Section 8.1: the entire section is important. By the way, this may seem like an obvious comment, but remember to distinguish between the notions of "uniform continuity" (see section 5.4) and "uniform convergence" — they're quite different things!
- Section 8.2: the entire section is important, except you can skip the final subsection titled "Dini's theorem". Also you may want to take note of the difference between the statement of Theorem 8.2.4 and the version which I stated in class. The version I stated in class assumed that the functions f_n were continuous, while Theorem 8.2.4 does not; it only assumes the f_n are Riemann integrable. Thus Theorem 8.2.4 is a stronger result than the one I proved in class. (On the exam, you will only ever need the version I proved in class, but it's nice to know that a stronger result exists.)
- Section 8.3: this section is not covered on this exam, but it would help to review it anyway, as it's a good source of exercises and examples on the material in the preceding sections.