Review for Third Exam

The third exam will cover sections 4.1, 4.2, 5.1, 5.2, 5.3, and 6.1 of the text. (The relevant assignments are assignments 22 through 27.)

Like the first two exams, this one will contain both questions asking you to state definitions or state and prove theorems, and questions asking you to solve problems. However, this one will have a higher ratio of definitions/theorems to problems than the first two exams. You should:

- Know the definition of limit of a function at a point (4.1.4).
- Know the sequential criterion for limits (4.1.8) and be able to prove that (i) implies (ii): that is, be able to prove that if $\lim_{x \to c} f(x) = L$ and $\lim(x_n) = L$ and $x_n \neq c$ for all $n \in \mathbf{N}$, then $\lim(f(x_n)) = L$.
- Know the definition of "f is continuous at c" (5.1.1).
- Know the sequential criterion for continuity (5.1.3). I will not ask for a proof.
- Be able to prove that the composition of continuous functions is continuous (5.2.6). I gave a proof in class that looks quite different from the one in the text; either proof is fine.
- Know the Extreme Value Theorem (if $f : [a, b] \to \mathbf{R}$ is continuous on $[a, b]$, then there exists $c \in [a, b]$ such that for all $x \in [a, b]$, $f(x) \leq f(c)$). This is stated a little differently in the text (5.3.4), but the two ways of stating it amount to the same thing. I will not ask for a proof.
- Know the definition of "f is differentiable at c" and "derivative of f at c" (6.1.1).
- Be able to prove that if f is differentiable at c then f is continuous at c (6.1.2).
- Be able to prove the sum rule for derivatives (6.1.3(b)).

In class, we only covered certain portions of the sections of the text mentioned above. You can study according to the principle that you only need know the portions of the text that were covered in class. More precisely, what we covered in class corresponds to:

- all of Section 4.1, except you can skip Examples 4.1.7(c,d,e).
- all of Section 4.2, except Theorem 4.2.2. We didn't strictly speaking go over everything in this section in class, but you should certainly be able to understand everything based on what we have gone over. That even includes Theorem 4.2.2, which should remind you a lot of 3.2.2.
- all of Section 5.1, except you can skip the discussion of the Thomae function in 5.1.6(h).
- all of Section 5.2.
- the only parts of Section 5.3 that we covered were Theorems 5.3.2 and (in a slightly different guise) 5.3.4.
- we only covered the first three pages of section 6.1.