The final exam is scheduled for Thursday, 22 December 2016, at 1:30pm-3:30pm. We'll be split into Fraser Hall and Nicholson Hall. **Pay attention to the webpage and email announcements to find out which room to go to.** At 120 minutes, the final is roughly 2.5 times the length of our 50 minute midterm exams. It covers Sections 1.1–1.4, 2.1–2.4, 3.1–3.5, 4.1–4.3, 8.1–8.3 and 5.1, but the exceptions from previous midterms and described in class all apply:

- In Section 3.2, you do not need to memorize the axioms defining an ordered field. You might think that means Section 3.2 won't appear on the exam at all; that's almost true, but recall that a few things (like exercise #7) turned out to be important throughout the rest of the semesters.
- In Section 3.4, you are not responsible for accumulation points or the closure of a set.
- The only thing you need to know from Section 3.5 is that a subset S of $\mathbb{R}$ is *compact* if and only if it is closed an bounded. Therefore any questions about compact sets are really questions about when a set is closed and/or bounded.
- Any material that was not covered on earlier midterms (and especially if it wasn't covered on homework either!) will only show up in relatively straightforward ways. For example, I said in lecture that you should know the definition of a power series, radius of convergence, and interval of convergence, and we did an example of finding the radius and interval using the ratio test from Section 8.2. I said you didn't need to learn the "new" versions of the ratio and root tests in Section 8.3, which are really just the Section 8.2 tests applied to this specific situation. Similarly, any $\varepsilon - \delta$ question from Section 5.1 will be very similar to the problems described below in this guide.

> The best advice I can give: start studying early! We have a week before our final exam. You have other courses to work on, but studying for 3283W for just an hour a day would do more good than trying to cram 12 hours in the day leading up to our final. You'll be under less pressure, have time to ask us questions, and be able to review more material.

The next best advice I can give is the same that I've given for previous midterms: you should learn the definitions and theorems, but **there is no substitute for *doing* problems**. It's easy to listen to an instructor solve a problem, but that's much different than being able to do it on your own, under time pressure, and without any notes, textbooks, or other resources. If you work through enough problems out of the textbook, previous exams and homework, you'll walk into the exam with the confidence that (a) you've seen and solved most of the "standard" types of questions you'll see on the final, like a proof of convergence, and (b) you have the skills to work out anything that is different than those standard questions. As an added bonus, by working on problems you'll probably learn the theorems and definitions you need by heart, without a lot of extra effort.

Which problems should you solve? Here's some specific advice:

- Look over all three midterms; solutions are posted on the Moodle site. Focus on any problems you struggled with. Read the online solutions and ask us questions as needed until they make sense. Then see if you can solve the problem correctly without looking at any notes, books, etc. Then look in the textbook to find any similar problems and solve those.
- Repeat the above process with any homework assignments and writing quizzes. Solutions to all of those have been posted, too.

- Once you've looked over previous problems and want to study a particular section, the true/false questions at the beginning of each exercise set are a good way to check whether you remember the definitions and basic results from the section.
- As mentioned on previous guides, another technique for studying definitions and theorems is to come up with your own examples to learn why certain distinctions and conditions are important. In the Monotone Convergence Theorem, why is it important that the sequence is bounded? In the topology section, why would a set which does not include one of its boundary points not satisfy the definition of closed set?
- Don't set out to memorize the proof of every theorem in the book. There are certain standard proofs involving open/closed sets, intersections/unions/complements of sets, etc., but in general if a proof is on the exam, you should be able to figure it out using definitions and other given information. [In other words, if I ask you to prove the composition of two surjective functions is surjective (assuming the domains/ranges match up, etc.), then you can figure that out from the definition of surjective function and not by having memorized the proof of Theorem 2.3.20(a) and reproducing it word for work on the exam.]
- It's easier and more fun to study the problems that we're good at, but in the long run you'll get more benefit from doing the kinds of problems you didn't like, even if it's a struggle. If you get stuck, ask us for help!

Here are a few suggested problems from the sections that historically give people the most trouble in this class. (This list isn't meant to be comprehensive, and you shouldn't ignore the other sections. There's also some overlap here with previous assignments.)

§2.2: 14, 22, 32

§2.3: 9, 10, 11, 16, 17

§2.4: 3(a,b,c), 4, 11

§3.1: 7, 15, 19

§3.2: 6, 7

§3.3: 3/4(b, c, d, l, m)

§3.4: Theorem 3.4.10, Corollary 3.4.11, 3/4(b,c,e), 11

(α). (a) Find the sum of $\sum 1/(n^2+2n+2)$. (b) Determine whether $\sum n!/n^n$ converges.

(β). Use the $\varepsilon-\delta$ definition to prove $\lim_{x\to 1} 5x+2=7$, $\lim_{x\to 2} 4x-3=5$, and $\lim_{x\to 3} -2x+1=-5$. In general, if you use the $\epsilon-\delta$ definition for a function $f(x)=mx+b$, what will your choice of δ be?