MATH 275 – Review sheet for the first midterm exam

Time: Wednesday, October 10, 7:15PM-8:45PM,
Place: Social Sciences 6102 (NOTE THAT THIS IS NOT OUR USUAL CLASSROOM!)

This is an outline to help you study for the midterm exam. It is meant to give you a sample of problems, concepts, topics you may encounter on the exam. Note that anything that we covered in class is fair game: you might see problems or questions which are not explicitly listed here. You should definitely know how to do the homework problems that have been assigned.

Definitions

You should know the short, but precise definitions of the following concepts:

- Upper and lower bound, sup and inf.
- You should be able to state the least upper bound axiom.
- The complex conjugate and modulus of a complex number.
- You should be able to state the triangle inequality and the Cauchy-Schwarz inequality.
- Partition, step function, upper and lower integral.

Proofs

You should be able to write down the proofs of the following statements. (Note: you shouldn't memorize these statements or their proofs, you should understand how you can prove them!)

- $\sqrt{2}$ is irrational
- If z_1, z_2 are complex numbers then $\overline{z_1 + z_2} = \bar{z}_1 + \bar{z}_2$, same for products.
- Proof of identities and inequalities using induction. E.g. $\sum_{k=1}^{n-1} k^2 \leq n^3/3$.
- Statements involving sup and inf. E.g. if the non-empty set S has a supremum then for any $\varepsilon > 0$ there is an element $s \in S$ with $s > \sup S - \varepsilon$.
- Proofs of simple inequalities based on the triangle inequality or Cauchy-Schwarz inequality. E.g. show that for all x, y we have $||x| - |y|| \leq |x - y|$ or show that for any x, y we have $\frac{1}{13}(2x + 3y)^2 \leq x^2 + y^2$.

Computations

You should be familiar with the following types of computations.

- Basic operations with complex numbers.
- Polar coordinate form for complex numbers.
- n^{th} roots or n^{th} power of complex numbers.
- Operations (e.g. addition, multiplication) on step functions.
- Integrals of step functions.

Practice problems

The textbook has lots of problems we didn't have time to cover. You can look up the sections from which homework problems were assigned and try working on problems that weren't listed. (E.g. section I 4.10 on page 44 has lots of nice induction problems.)

Ask for help if you think you need it

If you are having trouble with certain type of problems or concepts then you should ask for help. Come to one of my or Jo's office hours and ask questions! If you think you may have trouble solving problems with a time limit then collect a couple (say five) problems similar to homework problems and try solving them in 90 minutes (with the solutions written up neatly). Remember that it is almost as important that you can present your solutions clearly as it is to actually find those solutions.

GOOD LUCK!