REVIEW FOR FIRST MIDTERM
MATH 104

You are expected to be able to...

- State the completeness axiom of $\mathbb{R}$. Use the completeness axiom to prove, for instance, the denseness of $\mathbb{Q}$, and any bounded monotone sequence converges.
- State the definition of a convergent sequence, a Cauchy sequence, the $\liminf$ and $\limsup$ of a bounded sequence.
- Prove the convergent of a sequence based on the definition (§8, 9.7).
- Prove the limit theorems (§9.1, 9.2, 9.3, 9.4, 9.5, 9.6) based on the definition.
- Prove that all of the following statements are equivalent:
  - (a_n) converges.
  - (a_n) is a Cauchy sequence.
  - (a_n) is bounded and $\liminf a_n = \limsup a_n$.
- Prove the theorems related to subsequences that we discussed in class (§11.2(i), 11.3, 11.4, 11.5, 11.7)
- State the definition of a metric space, open/closed subsets, interior, limit points, closure, compact sets, and understand basic examples.

In short, the exam will cover all the things we've discussed in class, and the homework problems.