

## Math 190A, Fall 2022

### Study guide for Midterm 1

- The exam is in-class on October 20.
- There are no notes or books allowed.
- I will provide paper, so do not bring a blue book.
- Content: everything in first 5 lectures. In my notes, everything through §2.1.

I don't have old 190A exams to show you, but here is what I expect you to know:

- All homework problems from Homeworks 1 and 2 (ignore optional problems) whether they were graded or not. You might see them in the exact same form, either partially or in whole. You might also see them with slight modifications.
- Definitions: you may be asked to repeat definitions. You don't need to memorize the exact wording, but you do need to give something that has the exact same meaning. To make this simple for you and me, just stick with our definition and don't use results (for example, for "closed subset" our definition is "complement is open"; one could also say "contains all of its limit points" which is technically correct, but for us that is a result, and not the original definition). Here are the ones you could be asked:
  - (1) Topology on a set / topological space
  - (2) Refines / coarsens
  - (3) Topology generated by a subbasis
  - (4) Basis for a topology (I don't assume that every point is in some basis element while Munkres does, you can do either one)
  - (5) Subspace topology
  - (6) Closed set
  - (7) Interior and closure of a subset
  - (8) Limit point
  - (9) Continuous function
  - (10) What it means for a function to be continuous at a point (Definition 1.7.6)
  - (11) Homeomorphism and embedding
  - (12) Product topology
- Statements of propositions / theorems: you may be asked to state a formula or to complete or fully give the statement of a theorem. Again, the exact wording is not necessary, but the meaning should be exactly the same. Anything not mentioned here you still want to know because it might be useful to prove something else.
  - (1) Prop 1.5.3 Properties satisfied by closed sets
  - (2) Prop 1.6.5 characterization of closure using neighborhoods
  - (3) Theorem 1.7.8 equivalent properties to being continuous
- Proofs of propositions / theorems: you may be asked to reprove a proposition or theorem from class, either in part or in whole. Here are the ones you want to know:
  - (1) Prop 1.4.2 (Subspace topology is a topology)
  - (2) Prop 1.4.9 (open in open subspace is same as open)
  - (3) Prop 1.5.3 (Properties of closed subsets)
  - (4) Prop 1.7.4 (composition of continuous functions)
  - (5) Prop 1.7.9 (how subspaces interact with continuity)
  - (6) Prop 1.8.4 (homeomorphism is continuous bijection that sends opens to opens)
- New problem: there will be one problem that is not covered by the above, but expect it to be around the average difficulty of the homework problems you've seen.