# TOPOLOGY FINAL STUDY GUIDE

Here is a list of things we've covered in class or on the homework since the second midterm, both of which are fair game. Again, it's possible that I missed something we've covered, in which case it might still be on the exam. If there's something conspicuously absent from this list, let me know, and I'll tell you which of the following two categories it's in.

## What to expect on the exam

The format will be similar to midterms but twice as long, since you've got twice as much time. I'll aim for a difficulty that's in between the two midterms we've had. About half of the final will be cumulative, and half will be on recent material. Equivalently, about two thirds of the final will be on material since the second midterm, and one third will be on previous material.

As before, when asked to provide or use a definition, you'll be expected to provide and use the definitions from the book or from class, not other equivalent definitions. You can use results from the book or from class in your proofs, but the results have to be more basic than what you're asked to prove. If you're asked to prove a theorem from class, you can't just write that we proved it in class or that it's a trivial consequence of an even more powerful theorem.

## Know this stuff

I think that most mathematicians would be able to define most of the things on this list from memory and work with these concepts, so you should be able to do so, too. There are lots of facts about them that would be helpful to know to speed up your proofs, and you should know how to prove the simpler of these facts.

- Uniform metric on $\mathbb{R}^I$.
- Uniform convergence of functions $f_i\colon X \to \mathbb{R}$.
- First countable space, countable basis at $x$, second countable space.
- Neighborhood of a point.
- Limit point.
- Compact space/subspace.
- Bounded space/subspace.
- Finite intersection property.
- Extreme value theorem.
- Limit point compactness, sequential compactness.
- Locally compact space.
- One-point compactification.
- Path connected space/subspace.

## Be able to work with this stuff

Here are other topics we've covered. Some of these are still topics most mathematicians would be able to define, but are tangential to the main point of the class. Others are ones which many mathematicians will vaguely remember from when they took topology. In either case, you should be able to work with them if reminded of the definitions.

- Urysohn metrization theorem.
- The $\ell^2$ metric on $\mathbb{R}^{\mathbb{N}}$.
- Isometric embedding.