

Departmental Honors in Math

Rich Schwartz

October 10, 2013

1 The Bottom Line

To get departmental honors in math you need to write an undergraduate thesis and turn it in by May 1 of your senior year. Of course, you also need to satisfy the concentration requirements. A somewhat less formal requirement for honors is that you have an excellent transcript. The sections below elaborate on this.

2 What is an Undergraduate Thesis?

An undergraduate thesis is a singly-authored mathematics document, usually between 10 and 80 pages, on some topic in mathematics. The thesis is typically a mixture of exposition of known mathematics and an account of your own research.

- If your thesis is mainly mathematical exposition, then the standards for acceptance will be quite high. We would need to see a polished, mature, and thorough account of a serious and advanced topic.
- If your thesis consists mainly of your own research, then the standard is something like this: The thesis should be correct and contain at least one original idea. The theses involving original research can be fairly short. Just state your theorem and give a complete proof.

As you might imagine, the standards for theses which interpolate between the two extremes would be an interpolation of the standards mentioned above.

3 When/How do I get Started?

If you want to write an undergraduate thesis, you need to find an faculty advisor who will sponsor your project. The faculty advisor will almost surely be a faculty member of the pure math department, though on occasion we have accepted theses written by people with applied math advisors. In these rare cases, the theses have been essentially pure-math theses.

I would strongly advise that you find a faculty advisor sometime during your junior year. You don't need to start working on your thesis during your junior year, but it is a good idea to have a plan in place before you start your senior year. The method of finding a faculty advisor is simply to knock on their door and ask whether they would be willing to sponsor you.

You don't need to have a topic picked out in advance. It is better to just ask a faculty member about sponsoring you and then later settle on a specific topic. However, it is a good idea, in case you prefer some areas of math over others – e.g. topology – to ask people who seem to do research in an area related to your preferences.

4 How do I write a Thesis?

In my opinion, the best kind of thesis is an account of original research you undertake on your own, without much help from a faculty member. Realistically, however, what usually happens is that your faculty sponsor suggests a topic and then guides you through the thesis to some extent. Roughly speaking, here are the three phases to the thesis-writing experience.

Phase 1: After you have picked out a topic, the initial phase of the project usually involves you “getting up to speed”. This probably would entail you reading some chapters from books or perhaps some research articles.

Phase 2: Once you have acquired some background, you might start thinking on your own on a particular problem related to what you have just read. For instance, perhaps you have read a paper which proves a particular result about 2-dimensional spheres. You might try to prove an analogous result for the 3-dimensional sphere. Of course, the second phase of your project – the original research part – could be very different from this. Maybe you'll just strike out on a new direction and come up with something unpredictable.

Phase 3: Once you are reasonably happy with what you have worked out (or once you start to hear the clock ticking, whichever comes first) you should start writing your thesis. It is a good idea to start writing as early as possible, to avoid a lot of sleepless nights right at the end. I would recommend that you start writing even before you have sewn up the whole thesis. Once you have figured out some portion of your thesis, you should write it up. Keep a kind of running document. It is much easier to fix and update an existing document than it is to start from scratch right at the end.

During all of these phases, you would probably meet with your advisor regularly. The frequency would depend on the situation. Probably you should meet more often if you are feeling directionless or “stuck”. On average, maybe you would meet your advisor twice per month.

5 The Endgame

It would be a good idea to turn in a draft of your thesis by **April 10**. Your advisor would then read the draft and make suggestions, either expository or mathematical. You should then improve the draft based on the suggestions and turn it in again. This process would repeat for several weeks. Then, you would turn in your thesis by **May 1**. You must turn in the thesis by May 1, or we won't accept it.

I usually tell my student advisees that, as regards deadline reminders, I will be like a gradually worsening malady. At the beginning of your last semester, I will give you a few gentle reminders about upcoming deadlines. By the middle of the semester, I will mention deadlines fairly frequently, with slowly growing vehemence. If I don't see timely progress as **May 1** rolls around, I will be a constant source of insistence and irritation, like a toothache.