

Math 101 Final Essay Guidelines

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First steps

1. Choose a model or concept that we have discussed during the course that you enjoyed or found interesting.
2. Do some independent reading/research about this topic. If you need help getting started, come see me and I'll give you some appropriate references.
3. Figure out what the strengths/weaknesses of your model are (if you've chosen a model). Figure out the rationale and empirical results related to your concept (if you've chosen a concept).

The essay. Your essay should include the following features.

1. For introduction: start with a full mathematical explanation of the topic you have chosen. This should include definitions of main terminology, and an explanation of why this topic is important. This should be pretty formal mathematically.
2. You have two options for the body of the essay.
 - (a) Find a theorem you like that involves your topic. State the theorem and describe its proof. Please don't copy word for word a proof you found somewhere. I have been reading student proofs for years. I promise, I'll know. Talk about why this theorem is important, and why it matters for the study of your topic.
 - (b) Write and run some code to test certain features in your model, or to test your topic in another model (like $G_{n,p}$). Write about how your simulations relate to existing empirical results. If you'd like some advice about computer packages to do this kind of stuff let me know; I'd recommend Python's NetworkX package as a first step if you're into Python.
3. Talk about why this topic appeals to you. What about it is interesting? How do you think this concept has contributed to the study of network science? This is squishy. It doesn't have to be as mathematically precise as the previous items.

Presentation.

1. Your essay should be typeset using a standard mathematical typesetter. Most mathematicians prefer L^AT_EX, but in other fields (some applied math, statistics, mathematically adjacent fields), Microsoft Word's mathematical typesetting is also an accepted standard. If you have other preferred typesetting programs, ask me about them. See here for a nice intro to L^AT_EX. You are more than welcome to copy my preamble if you wish, although many nice templates are out there for the taking.

2. I believe it will be virtually impossible to complete the assigned tasks in less than 3 pages. I also believe it will be entirely unnecessary to write more than 6 pages. Officially, there is no required length. It may be the case that you have figures from empirical results that take up a lot of space; that's ok.
3. You should have a bibliography indicating the sources from which you are pulling your main ideas. Unlike most people, I WILL accept Wikipedia as a source, as most of the mathematics on Wikipedia is excellent. I will NOT accept ONLY Wikipedia as a source. For the theorem you choose, you should cite the person who originally proved it, and their original paper. I highly recommend using `BIBTEX`, as the citation code is copy-pasteable from Google Scholar.

Scoring. Scores will be assigned on a scale of 0-20 points. Roughly, this is what your score should look like.

- 20 points: Essay demonstrates well-developed understanding of concept. Mathematics is precise, symbols are clearly defined and correctly manipulated. Minimal typos.
- 16-19 points: Essay demonstrates reasonable understanding of concept. Mathematics is occasionally fuzzy; symbols not always clearly defined. Minimal typos.
- 12-15 points: Concept not clearly explained, or presented with a slightly incoherent understanding. Mathematics is often fuzzy and occasionally wrong. More than minimal typos, minimal inconsistencies.
- 8-11 points: Concept not clearly explained or is explained incoherently. Essay does not meet standards of presentation or writing guidelines. Symbols are incorrectly defined, incorrectly used, or undefined. More than minimal typos or inconsistencies.
- < 8 points: Nobody should score in this range unless they literally do not complete this assignment.