

MATH 157: Mathematics in the world

Guidelines for the Final Project 2019

The main criteria for the final paper are:

- clear and rigorous proofs;
- readable and flowing exposition;
- bibliography;

The following guidelines are very flexible and depend on the context. You might have your own philosophy towards writing a paper. My goal here is just to emphasize some things to pay attention to while writing a maths paper.

Ideally, the text should be complete, but concise. Nothing can be added to make it better (like a definition, an explanation of an algorithm, elaboration on an argument or an enlightening example) and nothing can be removed without making it worse (like a complementary statement that seems interesting on its own, but will take a paragraph to explain and doesn't contribute to understanding of the rest of the paper, or two examples that are conceptually the same).

Another tip is to pay attention to the “chronology” of your paper. For each statement/definition/paragraph try asking yourself: “Why do I give it here?”. It's good to formulate the main statements as early as possible, but they should be clear to a reader. A definition that will only be used two pages later should probably be moved further in the text. An example that demonstrates the strength of the theorem might be more enlightening if it follows the statement.

Here is a possible plan for your paper:

1. **Introduction:** a readers' guide to your paper.
 - (a) introduce your topic and the objects of study;
 - (b) give precise statements as early as possible (make sure to define new notions to make the main statements clear, but don't give too much background on the definitions);
 - (c) give references within your paper (e.g. “We will discuss these definitions in detail in the next chapter...”, “In chapter 3 we will give proof of the following statements:...”).
2. **Background:** set a playground for the main results, give a feel of the subject to a reader.

- (a) give some historical background on the problem;
 - (b) introduce main notions and give definitions;
 - (c) use examples and pictures to give a reader an idea of the problem/notions/definitions, and why is your subject interesting.
3. **Main proofs:** give clear and rigorous proofs of the main results.
- (a) try to breakdown your proof into smaller statements (e.g. lemmas, propositions).
4. **Open questions:** you can include further directions for the research, if you want to.
5. **Bibliography:** make sure to include all references you've been using.