SURIM 2016 — Final Reports First Drafts

Below are my expectations for your final SURIM reports (first drafts, anyway). Your first drafts are due August 19th. You should send them to me by email, attached with the both PDF and TeX files.

In addition to the expectations below, please read “Writing a research paper in mathematics” by Ashley Reiter, and/or “How to write mathematics,” by Paul Halmos (linked from the website).

Finally, though you have tons of examples of literature to look at by this point, I’ll upload some examples of mathematical writing and briefly explain what is good (or bad) about those examples.

Do your best! I’ll be reading your drafts and providing a lot of comments, so it definitely doesn’t have to be perfect the first time.

Length

There is no length requirement or limit, but I’m expecting something around 15–30 pages from each project. If your first draft is too long (or too short), I’ll tell you.

Abstract

Writing abstracts is an art. Is it too short? Is it too long? Is it... art? Write one, and I’ll help you create something succinct and beautiful as best I can for your final draft.

Introduction

The introduction should be an informal discussion of the problem at hand.

• Emphasize the motivation for the problem (why do you care about this problem? why would the mathematical community at large care about this problem? why is this particular problem different than problems that have been studied before?).

• Review in as much detail as you need, previous work done on the topic.

• State the main theorems you have proven (if your theorems need a lot of technical language you haven’t set up yet, that’s fine, simply point the reader to the section where these things are defined, and maybe give an informal definition—e.g. “by elliptic curve with CM, we mean an elliptic curve whose endomorphism ring is strictly larger than \( \mathbb{Z} \)).

If your theorems simply have too much technicality weighing them down, you can always put a more precise version later.
• The proofs of your main results should appear in the main body of the report (not in the intro). There are ways to format “Proof of X” in LaTeX.

• At the end of your introduction, include an outline (just a quick breakdown) of your report.

In Every Section After The Introduction

• Always begin every section with a few sentences outlining the purpose of the section as well as how it relates to other sections.

• If you have reference(s) that you could point to that covers some or all of the material in the section (or on which you based your exposition), mention it at the beginning of the section.

• If you have running assumptions, like “throughout this section, \( E \) will denote an elliptic curve with complex multiplication by the ring \( \mathcal{O} \),” then put these assumptions at the beginning.

• If a given section covers a particular object important or argument in your project, call out other places such objects/arguments arise.

• Don’t forget to include examples. Examples make everyone happy. We all want to be happy.

Basic Theory / Groundwork

• This section should be a somewhat formal development of the material that is prerequisite for understanding the results in your report.

• You should start with the very basics and work up to “standard results” that you would expect anyone familiar with the area to know already, but you should focus mainly on the parts of the theory you will actually need to use when proving your results.

The idea is that the report should be as self-contained as possible, within reason. (Don’t rewrite Hartshorne or Cox or anything like that. *Stick to what you need.*)

Example: if your paper is on elliptic curves, this is the section where you would define “an elliptic curve.” You might be tempted to define “abelian variety” as well, but you should do so only if there is a compelling need (you need deep results about abelian varieties, or if it somehow makes your exposition about elliptic curves simpler). It is totally acceptable to punt annoying prerequisite results to the references,
but you should explicitly state any not-commonly-known result that you use in a crucial way.

• If you need to make some notational conventions, this is where you should do that. You may need to refresh the reader’s memory of notational conventions now and again throughout the report.

Main Body
This is where you show us what you did this summer. Split this up into sections however you think makes sense. I’ll provide suggestions if I think you need more or fewer sections, or if they need to be permuted.

Acknowledgements
Be sure to thank anyone who has helped you (mathematically or administratively) in the course of this project!

References
• Everything you write should be attributed either to a reference or, if it is an original result, proven in a self-contained way in your report.

• That being said, every reference should be referenced at some point in your report. The reference could be as simple/off-hand as “for a more complete exposition on the theory of elliptic curves, see [Silverman] or [Koblitz].”