

# Tips for writing math

## Directed Reading Program

Department of Mathematics and Statistics  
McGill University

April 18, 2022

# General guidelines

- Think about how to structure things coherently
- Give motivation and context to what you're doing; try to write in a narratively interesting way
- Since most of what you write probably isn't original, write in your own words and make sure you cite where the material is from (probably can do entire sections at once)
- Think carefully about the background of your intended audience when thinking about when to give more/less details
- Technical aspects/ $\LaTeX$  - too much to go into here, but don't be afraid to ask for help! (also look at the template)

# Structure

A typical structure might look like

- Introduction - give context and motivation to the problem, including historical development if it's interesting. State your results, then give a conceptual, non-technical outline of the paper. Compare with other work in the published literature, and indicate some future research directions. Acknowledgements also often go here, at the end.
- Some setup/background sections - often, it makes sense to have separate sections to setup the technical tools/background you need for the main proof.
- Some sections for the main proofs/results
- Bibliography

# Writing is writing

Writing a math paper is still writing! It's important to keep your reader interested, motivated, so make sure to tell a story and explain conceptually *why* you're doing certain steps or making these constructions. Doing this will also improve your understanding.

Bad example:

## Example

To find the derivative of an element  $f \in R$  at the point  $x$  algebraically, we pick an element  $t \in (I_x/I_x^2)^\wedge$ , for the ideal  $I_x$  of functions vanishing at  $x$ . We then evaluate  $t$  on the class of  $f - f(x) \in I_x$ .

This is making a construction which is very conceptually related to familiar concepts (derivatives, Taylor series), but makes no effort to explain this, instead just giving the bare technical construction.

Though note it isn't always best to try to explain the motivation for every piece of a very technical construction; there are compromises to be made. One strategy is to have the main technical sections have less heuristic/conceptual narrative, but give more of it in the introduction where you preview what you're doing.

# What to include

- Many of your theorems and definitions will be basically copied, and that's okay - just cite and don't copy verbatim. A good tip is to try to write down the material without consulting the original source; this helps your understanding and makes it more likely you'll use your own formulation.
- Details of proofs - think about the background of your audience when you consider whether steps are worth including vs. assuming can be glossed over!
- Related: Don't call things easy or trivial! If you want to omit/just outline some steps of a proof, you can say the reason why directly: maybe it's the same as this other proof, maybe it's a direct computation that isn't conceptually enlightening, etc. Don't just say it's trivial.