MATH 4370 / MATH 7370
Fall 2023
Project assignment 2 (PA2)

Due no later than Friday 17 November 2023 at 23:59

The aim of the project assignments is to nudge you along towards your final project. This is done by setting and testing milestones.

1. By mid-October, you should have chosen a type of project and a rough area for the project and have started basic reading about your project.

2. By mid-November, you should have done more reading on the subject, have identified the main references you need and should prepare to start working in earnest on the project.

Things will be easier if you devote time to the project on a regular basis rather than try to cram everything at the end of term, when you will be, for some of you, writing final examinations in other courses.

Instructions/remarks.

- This assignment is the same for students registered in both versions of the course.

- This assignment (PA2) is due no later than Friday 17 November 2023 at 23:59.

- This assignment must be submitted after assignment PA1. Please wait until you have received feedback about PA1 before submitting it.

- Submissions must be typeset using LaTeX, Libre Office or Word and submitted in PDF format. No other formats will be accepted.

- MATH 4370 students are allowed to work in pairs. In this case, please return a single project assignment bearing your two names.

- Finally, an important remark: of course, your subject may evolve between different PA's as a response to the feedback you receive. These assignments are by no means a contract and if you were to change topics later, that would have no consequence. (Except that you would have less time to complete the project, of course, if you were to switch topics late during term.)

Note that there are two extra pages after the questions. On one, I provide a sketch of the evaluation sheet that I will fill to evaluate your project, with comments and guidelines. This should allow you to better understand what I will be evaluating. The other page concerns writing a bibliography, which I expect you to start doing for this assignment.

This assignment expands on PA1, while following essentially the same structure (beware: there are slight variations from PA1). I am expecting that this submission will be at least 4 pages long. Your answer should detail at least the following points:

1. Type of project you will be working on: article commentary, lecture notes or research project.

2. Name of the paper you will be working on or topic you are writing lecture notes about.

3. A minimum of one page (when typeset) summary of the main points that the paper develops or the course notes cover. If working on a paper, you can use the abstract to help you with this, but please do not strictly paraphrase the abstract, expand on it.

4. Skeleton of a plan: what are the main sections you plan in your report? Describe each section with a couple of sentences following a section header. A report/paper typically has an Introduction, one or several main sections, perhaps cut up in terms of topics, a Discussion (or Conclusion), a list of references and sometimes Appendices. Lecture notes consist in a chapter resembling what you know in a textbook.

5. Main mathematical concepts used in the paper. (This can be a bullet point list, provided you give a little detail about each concept.) Expand on what you presented in PA1, go a bit more into details.

6. Somewhat fleshed out reference list, tied to specific notions. For instance, if the paper relies heavily on similarity transformations, you could say "Similarity transformations: [Chapter 1, X]", where X is the index of Horn & Johnson in the reference list. By now, you should probably have a minimum of 3 main sources as well as several more minor ones. List these references in proper reference format; see later for details on formatting references.

7. Anticipated difficulties. You will need to be able to explain the content of the paper in detail. Where do you anticipate that knowledge gaps to lie? For instance, if the paper uses three main concepts and that you feel that you understand well two of them, list the one that you feel uncomfortable with. For lecture notes, list the main problem points: are there notions you need to study in more detail than others? Has your understanding of these issues progressed since PA1?

8. Detailed "computer plan". What do you want to accomplish using a computer and how do you plan to do that? You can start laying out some plans at this point, plan functions and graphs if relevant. In rare instances, it may not make sense to have any computer work at all. If that is the case, convince me: explain why computer work is not appropriate in your project. If I "buy it", then you will not be marked on that aspect. Note that other evaluation criteria will be looked at in more detail, as a consequence.

Each part is given a mark from 0 to 10. The mark attributed is indicated between square brackets in the section title. It is possible that a section is not relevant for your project; this could be either "Figures and tables", "Numerical/computer algebra/algorithmic work" or "Oral presentation of the work". In this case, the feedback to PA2, which will include an empty version of this page, will include the mention [**NA**] for these sections.

Your project mark will be out of $10N$, where N is the number of sections not including the mention NA. This mark will be converted to percentage points.

Clarity of the exposition [ ]

Two main components: legibility of the work (typesetting) and language. If English is not your native tongue (even if it is, in fact..), it is good practice to get someone else, preferably a native speaker, read your work. Typesetting is important as well. The manuscript must not feel like something put together in two minutes. Fonts must be homogeneous throughout the document. Punctuation must be adequate.

Comprehension of the material [ ]

Do I get the feeling you are just paraphrasing some reference or have you really developed an understanding of the material?

Bibliographical references [ ]

Two components. Are references appropriate and sufficient? Is your bibliography section well formatted? See next page for details.

Figures and tables [ ]

If you have to produce figures or tables, you should make sure they are informative. This is an optional section, since some work does not really lend itself to including figures and tables. My evaluation of PA3 will indicate if I think you can skip this aspect.

Numerical/computer algebra/algorithmic work [ ]

Given the project you chose, this may or may not be relevant. My evaluation of PA3 will indicate if I think you can skip this section. If this part of the evaluation is required, then I will be looking for meaningful numerical/computer algebra or algorithmic work.

Oral presentation of the work [ ]

Time permitting, this will be required from students in MATH 7370. For students in MATH 4370, this will not be applicable even if you choose to present the work.

Using references and formatting a bibliography

Very important !! At this level, in mathematics, you are often going to be citing results verbatim or almost verbatim. This is okay **provided** you cite your sources correctly. This is particularly important in a project such as this one since you will be using advanced math but likely will not be developing anything new. In this context, proper citations often make the difference between good work and an academic dishonesty accusation.

Proper citations involve two components:

1. good use of citations in the text;

2. correct formatting of references at the end of the manuscript.

I will be on the lookout for this and will provide warnings should you proceed in a *dangerous* way. The project you submit should be clean, though.

Citations in the text

- Well-known results do not need a source, unless the statement is very different from the "norm". For example, you do not need to provide a reference for, say, the fundamental theorem of calculus.

- If an entire section is derived from a small number of sources, you can sometimes use a "blanket" statement. For example, you could say "The following section is based on [X, page 23] and [Y, page 42]". (X and Y refer here to the index of the citations in the list of references at the end of the manuscript.) If your work is about a particular paper, you only need to make the statement once, since the assumption is that what your manuscript is about. Note that if [X] is the reference of the paper you are commenting and that you need to discuss the work in [Y] and [Z] at some length, it can be a good idea (for legibility) to bring things back to [X] with a sentence like "Returning to [X]".

- If citing a single result, you can cite in the result header or just before the result.

- If you include proofs, I want to get a sense that you understand what you are doing. So indicate the reference where the idea of the proof comes from, but please make sure to try to understand it and formulate it in your own words. With advanced results, this is often easy, since proofs will often omit a lot of details and your proof should compensate this.

- Citations in the text can be numbers, referring, as explained above, to the index of the reference in the list of references. They can also be a bit more detailed; for instance, [Asi1951], [Adams1979] or (Tolkien, 1954). Be sure to use the same format throughout the manuscript, though.

Reference list

- Goes at the end of the manuscript, typically after the Discussion (or Conclusion) and before any Appendices.

- Several different formats are possible. As for the way to use citations in the text, the most important is to be coherent and consistent.

- See some material on the libraries website: `https://libguides.lib.umanitoba.ca/mathematics/writingciting`. Ask me questions. Ask a librarian (they can help!).

- If you are using LaTeX, I *very strongly recommend* using BibTeX. If you I were your supervisor, I would go further and *impose* it, because doing anything else is nonsensical and a waste of time. Again, if need be, ask, I will be happy to show you how to do.