

TRANSITION TO ADVANCED MATHEMATICS

PRACTICALLY PERFECT PROOFS

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Math 215

§A. Introduction

Over the course of the semester, each student will receive about ten problems whose solutions involve crafting coherent, convincing, and mathematically correct arguments, also known as *proofs*. These problems are sometimes difficult and always require careful thought, lots of attention, and lots of time to think and make mistakes.

You will need to submit a formal, correct, professionally-typeset solution (a P^3 or Practically Perfect Proof) for these and each will go through a revision process. The first time you submit your P^3 , you will receive a provisional grade and feedback on your work, and may choose to resubmit the assignment.

Note that only the last submission will be counted for your score. *Thus it is possible to receive a lower grade on the final draft than the provisional grade on your first draft on the same problem*, if you make changes to your solution that lower its overall quality.

- This is an **independent** assignment that you should view as a take home examination. You may not discuss the problems with anyone except me. This means you cannot talk to other students about your solutions (or even which problems you are choosing to work on), nor can you ask for help from the TA or other professors, nor from any person in an online setting. *Violation of this policy is grounds for failure of the course.*
- You may **not** refer to any sources other than the lecture notes and textbook for this course. This includes a prohibition against looking things up on the Internet unless you are directed specifically to do so in the context of a problem. If you think that you need some background material or a definition from another source then you may ask me for permission, and if granted then you may look up the necessary material and include it with a footnote in your proof. *Violation of this policy is grounds for failure of the course.*

The first P^3 assignment consisting of two problems will start around week five, and new problems will be assigned on a weekly basis until about two/three weeks before the end of the semester. Part of the purpose of these P^3 assignments is to give you the opportunity to improve your mathematical writing and writing skills in general. *All P^3 assignments must be typeset in \LaTeX , which will provide you several opportunities to learn this skill before your final EP.*

§B. P^3 Grading:

The intended audience for proofs written in this course is your classmates, and you should write with them in mind. Figuring out how to prove something is often difficult and involves scratch work and experimentation. However, in addition to being logically correct, the proof that you ultimately write and turn in should be neat and easy for your readers to follow. The entire point of writing a proof is to **communicate to others** the truth of the statement you are proving. **Each proof will be graded according to the following rubric.**

E	Excellent work, no real complaints.
M	The argument is basically correct, but missing some formal details, has \LaTeX issues, or is not as clearly argued as I would like.
P	The argument is mostly correct, but there is a misstep in the mathematics or it is especially poorly written.
X	Some ideas in the right direction, but did not really get there.
N	Did not attempt the problem or it was completely wrong or incomprehensible.

The graded proofs are a chance for me to give you some feedback and for you to understand how your writing is progressing. If you are getting a lot of ‘P’s and ‘X’s on a particular topic or proof technique, then that is an indication that you should practice that topic or technique more or come see me for some clarification.

§C. Frequently Asked Questions

Following are some (asked and anticipated) questions about this assignment. You should read all of this carefully and follow the instructions accordingly.

- **What other requirements are there for my P^3 Problems?**

The solution for each problem must be written using complete sentences and according to the “Mathematical Writing Practices” appendix from the lecture notes. It must be typeset, well organized, and easy to read. Proper grammar, proper sentence and paragraph structure, and correct spelling are necessities. *Submissions that do not adhere to these basic requirements will receive a draft score of ‘N’.*

- **What happens if I submit an incorrect or incomplete solution?**

When you submit a draft within the first deadline, I will return your problem and indicate if it is finished and ready for final version or if it needs more work. While provisional grades are given as a guide, there is no penalty for a low grade *until the final draft is submitted*.

- **Can I work with someone else or use sources other than the textbook or my class notes?**

No. No collaboration is permitted. See the first page. One of the primary goals of Math 215 is that you acquire deep personal understanding of proof techniques and the ability to read and write proofs. Being able to do so independently is essential, and thus this project is an independent endeavor.

- **Can I come to your office hours for help?**

Yes! You are welcome (and encouraged) at any time during office hours to discuss questions on the P^3 assignments (or any other aspect of the course). If my stated times do not suit your schedule, please request an appointment (ideally, at least 24 hours in advance). There is only one requirement for you when you come to seek help: **do not come empty-handed**. By this I mean that you should not come unprepared saying that you *“have no idea where to start.”* Part of learning to write proofs is thinking of possible ways to start, even if those ways turn out to be wrong. When you have chosen a problem to work on, start your scratch work with a list of things that you know which seem like they might be related. Write down what you know and what you need to show, and see if any of your ideas help with even a small part of this task. If you come to office hours without having seriously undertaken the basic groundwork on solving a P^3 problem, I will defer meeting with you until a later time when you’ve had a chance to do so.

The actual problems start on the next page. They are not available on github.