Overview

It is a truth universally acknowledged that one learns mathematics by doing mathematics. In mathematics courses, a significant part of *doing mathematics* is doing problems. Unfortunately, due to the pace of the course, the volume of material that we must cover, and the many worthwhile demands of life beyond the course, the amount of mathematics that you can reasonably be expected to do each week has its limits. To encourage you to think beyond the constraints of weekly problem sets and focused exam preparation, to help you make connections across possibly disparate aspects of this course and to other courses in the undergraduate curriculum, and to hone your expository and argumentative skills, you will prepare a portfolio of 10 problems for submission at the end of the term. These problems will (largely) appear within the lecture notes, and they will (largely) be more difficult or simply more involved than problems that will appear on weekly problem sets or on exams. Guidelines for your selection of the problems, formatting of your solutions, and my grading of your work appear below.

1. Selection Criteria

Candidate problems for the portfolio will be marked (+) in the lecture notes; occasionally in the weekly problem sets, I will recommend problems from the textbook as candidates for the portfolio. To ensure that you study a diverse array of problems, you must follow a "distribution requirement": submit 2 problems from material covered before Exam 1, 2 problems from material covered between Exams 1 and 2, and 2 problems from material covered after Exam 2. Specifically, 2 problems must come from material in the lecture notes or mentioned on a problem set on or before February 16; 2 problems must come from the time period February 19–March 29; and 2 problems must come from on or after April 3. There will also be some problems in the appendices; I will state at the start of a section in an appendix the date to which that material corresponds.) You may choose the remaining 4 problems from any period throughout the course; note that neither the placement of a problem (i.e., earlier in the term vs. later) nor its length (some will have multiple parts) is a sure indication of its difficulty.

In general, you should select problems that you find interesting. What excites you? Challenges you? Makes you curious? Relates to another class that you enjoyed?

Some problems will require knowledge of other courses, but there will be more than enough problems that do not have any prerequisites outside this class. The precise number of portfolio problems available in the notes and problem sets will vary from week to week. You are welcome to discuss your portfolio problems with other classmates and even work on the same problems, but everyone must submit an individually written assignment. You are most certainly welcome to discuss your portfolio problems with me at any time, in person or via email. If something catches your interest and you want to explore it as a portfolio problem, or if you see an interesting problem in the textbook that I did not list as a candidate for the portfolio, please feel free to run it by me (but don't be too disappointed if I reject or modify your initial suggestion).

If you find yourself working on a common theme of problems, you might consider giving a talk about your experience with the project in the Math Talks seminar. In fact, if you want to give a talk on your work, you only need to submit 8 problems for the portfolio

(maintain the distribution requirement above and reduce the "remaining 4 problems" to only 2 problems), and the talk will count as your ninth and tenth problems. Please discuss this with me if you're interested.

Submission Criteria

Submit a single pdf containing solutions to your 10 problems to the `Portfolio` slot on D2L by 11:59 pm on Monday, April 29. No late assignments will be accepted. Present first your solutions to problems from the lecture notes in the order in which those problems appeared in the notes; subsequently, present any problems from the textbook in the order in which they appeared in the textbook. Your solutions should be pristine; they should have the same level of detail as your work on weekly problem sets, and they should be written with the same professional care that you would give to a term paper in a history or literature class. I strongly prefer that the portfolio submissions be typed. We can talk about working in LaTeX, which is the program that I use for typesetting all math.

To keep you on track and prevent you from having too much work to do at the end of the term, you will submit drafts of your solutions to your 2 chosen problems from before Exam 1 with your Exam 1 reflection activity (see the syllabus) and also to your 2 chosen problems from between Exams 1 and 2 with your Exam 2 reflection activity. These drafts are *drafts*, and they definitely don't have to be perfect, but I should see that you are clearly on track to a complete, correct solution to your problems. You are welcome to submit different problems from these 4 for the final portfolio, but this will guarantee that you have at least 40% of the portfolio complete by the time of Exam 2. You will not submit any drafts along with your final exam reflection; you'll have more than enough work by that point in the term!

Grading Criteria

I will score the portfolio out of 60 points. I will score each problem on the usual problem set scale of 0 to 5 points, with 0 for no work, 5 for completely correct work, and, in general, a 1-point deduction for each serious error in the work. The remaining 10 points will come from the exam reflection drafts: 5 points per reflection if 2 drafts are present, 2 points if only 1 draft is there, and 0 points for no drafts. If you give a talk in the Math Talks seminar in lieu and submit only 8 problems, we will agree together on grading criteria for the talk that will yield your remaining 10 points; the goal of the seminar is, in part, to allow you to practice your public speaking skills, and so we will look for rhetorical quality in your presentation.