Writing clear and convincing proofs is one of the major types of mathematical writing, and hence it is very important that we provide you with plenty of opportunities to learn it. Some of you may already feel somewhat comfortable writing proofs; others may not have had many chances to practice this type of writing yet. Never fear, you'll all have plenty of practice in this course! This process will aid your mathematical development and can, I've found, significantly improve your clarity of thought outside of math as well. Because so much of the point of this class is that you learn to write proofs well, I of course have to set high standards for your homework. However, while I want your finished problem sets to reflect good proof-writing techniques, I also know that this takes practice. The way I handle this dilemma is to allow you one rewrite of any problems you made a real effort on the first time.

HOW I GRADE THE PROBLEM SETS:
The first time you turn in a problem set, I grade each problem and also assess the effort you put into the problem set as a whole.

As for the grading of each problem, I look at two facets–mathematical content (that is, is it right?) and presentation (that is, is it clear and well-written?). It does no one any good (not even you) if you understand the idea but can not explain it clearly.

Most of the homework problems will be worth 5 points. For 5-point problems, the possible scores on your first try will be 5, 4.5, 4, 0, or No Grade.

- 5: a clear and concise proof with no mathematical errors – excellent in both content and presentation.
- 4.5: Quite good in content and presentation. You may not rewrite a 4.5.
- 4: excellent in one facet, good in the other. (This might mean an excellently written proof with small mis-statements that didn't de-rail the course of the proof, or a mathematically correct proof that was clear but not as smooth as it could be.)

  You can keep a 4, or choose to rewrite it, for a maximum of 4.5 points.
- No Grade: A solution which displays a genuine attempt at finding a solution but which has serious omissions or errors, **or** which is unclear (even if it is mathematically correct). This reflects that in order for you to "get" the problem, you need to put more thought into it, and should rewrite it.
- I will give 0s for those problems which I do not feel you made a serious attempt to solve. While I certainly encourage you to do these problems for your own benefit, they can not be rewritten.

On the second try, the possible scores will be 4.5, 4, 3, 2, 1, or 0.

- 4.5: excellent in both content and presentation. Available only on problems that received a 4 the first time around.

- 4: quite good or excellent in both facets.
- 3: good in both facets
- 2: good in one facet, inadequate in the other
- 1: inadequate in both facets
- 0: substantially incorrect

(Of course, there are other combinations – if the mathematical content is correct but the presentation is inadequate, that would earn a 3, etc.)

In addition to the points you receive on each problem, you will receive an additional score between 0 and 4, based on my subjective assessment of the effort you put into the problem set. The more "No Grades" or 0's you receive, the lower this additional score will be. I do this assessment of effort to discourage students from putting less effort into the first draft. The benefits of the second draft lies in the process of thinking through a problem several times, and in the feedback I give you on the first try; if your first attempt was not backed by real effort, then you get neither of those benefits. Furthermore, if you blow off the original homework, there's a delay in your learning the material –thus making the next material significantly harder to get; and on top of that, if you're putting all your effort into last week's homework, then of course you're blowing off this week's homework and will have to rewrite most of *those* problems.

When Problem Sets Are Due

Problem sets are due Wednesdays at 2:30 pm. Rewrites are due, along with your original paper, within **one week of when I return the homework to the class**. Usually, I will return the homework on Friday, so you must turn in your rewrite by classtime the next Friday.

Be aware that

Late Homework is Not Accepted!

I will only make exceptions in well-documented cases of dire need. Because you can not rewrite problems on which you receive a 0, it is very important that you do not neglect to turn in any problem sets.

Guidelines For Working With Others

An important aspect of your mathematical development is that you learn to discuss mathematics with others and to collaborate on problems. I think it's a really good idea to get in the habit of regularly meeting with others in the class to discuss the problems. That being

said, I suggest you give serious thought to the problems before meeting – otherwise, you can become confused and even intimidated by other people's ideas.

The homework assignments will alternate between Individual assignments and Group assignments.

On the group homework assignments, you **must** work in a group of two (three is only acceptable if there's an odd number of people in the class) and turn in one paper between the two of you. It is extremely important that both of you understand every solution that your group produces. If one of you has a brainstorm and figures out a tricky problem, the one who had the brainstorm should take the time to make sure the other partner understands it, and the one who did not have the brainstorm should be sure to ask whenever there's a leap of logic they don't follow. On each assignment, one student will be designated as the primary author who writes the solutions, and the role of primary author must alternate between the members of the group. **Make a note on your homework of who the primary author was.** If your partner for any group assignment is failing to meet with you, let me know. I particularly dislike giving a 0 for a late group assignment when one member of the group really was trying and the other member let them down.

For the Individual assignments, as I mentioned I still encourage you to work with other students, but each person **must** write up the proofs on their own – in their own words, and turn in a separate paper.

Guidelines For Homework Presentation

Everything in your paper should be precise, comprehensible, completely justified, and written in complete sentences. People reading your problem set should not have to think very hard to understand you –we should be able to completely understand how each step followed from the one before (or when a new train of thought is starting) without having to think very much at all. This means paragraphs, introductions, transitions, and explanations are all necessary.

Here are a few guidelines for the presentation of your homework. If you do not follow these, I **will** return your homework to you ungraded, or – in extreme cases – with 0's on every problem.

- Your writing must be clear and legible.
- Do not turn in a first draft. You should revise, polish and rewrite your solutions.
- Be sure to put separate ideas into separate paragraphs, leave space between paragraphs, and space between problems. All of this space serves two purposes: firstly, it gives me plenty of room to write comments, but also, it calms the reader (I, at least, get tense and irritable when a lot of information is crammed into a small space).
- If you write in pen, only write on one side of the page, and there should be no scratch-outs. I prefer pencil.

- Do not turn in paper torn from a spiral notebook with ragged edges. Separate sheets should be stapled together (not paper clipped, or corner-folded).

HOW TO MAKE THE BEST USE OF THE SOLUTIONS IN THE BOOK:
The odd-numbered problems in the book have solutions in the back. Sometimes, they have enough information to give you a complete solution with little work; other times, they simply point you in the right direction. In either case, you should be careful to **use these wisely!** On the one hand, having access to plenty of proofs or proof outlines can help you to see the way we present a series of connected ideas to form a convincing proof. On the other hand, you will not learn to write a proof from scratch if you peek at the solution after even half an hour of thought – the whole idea behind proving something is trying many different approaches until you find just the right one. My suggestion, therefore, is that those of you who feel uncomfortable writing proofs may want to look at the solutions to several **un**assigned problems to get a feel for how the outlines of a proof should look, and for phrases that are commonly used. Be aware, however, that these solutions are not always complete, so you may need to fill in details that explain the leap from one step to the next.

Of course, **a proof that has been copied out of the back of the book will receive a 0.**