Parameters for Evaluating Presentations

The objective of presentation evaluations is to provide you with feedback that you can use to sharpen your future presentations. Good presentations are a combination of thorough and thoughtful mathematical preparation, a structured plan for presenting information, and polished boardwork and delivery. These are the basic parameters your presentations will be evaluated upon. In a given lecture, your presentation will be rated according to the following scale:

	Poor	Fair	Good	Great	Excellent
Mathematical Preparation & Mastery					
Presentation Structure & Content					
Boardwork & Delivery					

Your presentations form an important part of the "presentations and class participation" component of your grade. I'm interested in the trajectory of your presentations than I am in calculating your "average performance," so don't be worried if you struggle when first presenting. Students who use the feedback they receive to improve their future presentations will have their final presentation grade reflect their higher-quality work.

Mathematical Preparation & Mastery. Your presentation begins with you sitting down to carefully read and understand the material associated to your presentation. As you read through the text, get in the habit of creating examples of newly defined terms as soon as you see them. You should also be reading the provided proofs with a skeptical eye; just because the author makes an assertion doesn't mean you have to believe it! You should constantly be asking yourself "Why is this claim true?," and you shouldn't feel content until you can confidently back up any assertion made in the text. Perhaps most important: don't be lulled into thinking that you understand the proof simply because you can write down the author's argument line for line. You need to have a simultaneous grasp of the proof's details as well as its holistic structure; you need to understand not only what to say, but also why you're saying it; you need to be ready to answer questions that your fellow classmates will ask. In preparing for your presentation you'll likely have thought about things 10 times more deeply than you could possibly present in class. This additional preparation allows you to give coherent answers to questions from the audience, and it is indispensable when it comes time to map out your lecture.

I suggest you work to develop the ability to read on several different levels. First, read the text with an eye to answering "What is the basic mathematical story?" Answering this question forces you to think about the overall narrative that's being explored, the basic mathematical objects or qualities that are being introduced in service of that narrative, and the leverage that the stated theorems provide in pushing the narrative forward. On the other hand, answering this question almost certainly won't require you to understand (or even read) the details of any provided proofs. It is at this depth that you should first read your own section. Next, reread your section with an eye to answering "Do I understand and believe every sentence that the author is writing?" When reading at this depth, you'll spend very little time worrying about the narrative, but will instead focus on carefully reading and analyzing the author's proofs. Do you understand how each sentence logically follows from its predecessor? What each paragraph accomplishes? Can you fill in all the details that the author leaves out? Finally, reread the section to synthesize the macro- and micro-understanding that these two readings have given you. Note that any one of these phases will likely require multiple read throughs; for example, I am rarely able to complete a "deep read" of a section without a few attempts.

While it's natural to aim for mathematical mastery of the topic(s) covered in your particular presentation, it is perhaps less obvious — but no less important — that you also have a working understanding of how your topic is connected to topics already covered *and* topics that are going to be covered later. This means to understand the material from your topic, you'll have to at least read for the "highlights" from later presentations. This will help you as you work to position your presentation into the larger narrative.

Presentation Structure & Content. Once you have a complete understanding of the mathematical narrative attached to your section and the proofs it entails, you are ready to plan your presentation. It is easy to think that your presentation will be drawn solely from the text, but this is rarely the case. Not only should you be prepared to discuss proof details that the author leaves out, but you will likely be presenting your own examples of newly defined mathematical objects or qualities.

The objective of your presentation should be two-fold: to tell the mathematical story and to make the material believable and approachable. The only limiting factor is the allotted time for the presentation (though even this is somewhat flexible). You will routinely find that you don't have time to give a complete treatment of every detail of the material you have to present; instead, you'll have to decide how to appropriately balance narrative, intuition and detail to fit the allotted time. As a general rule, completely excising one of these components to make time for the remaining components isn't a great idea. Instead, focus on planning ways to say and write things in the most efficient way possible, and prioritize those things that are most important. Be thoughtful about what you will say and how you will say it. Do not waste time saying something that's not important or in giving a roundabout explanation for something that has a more straightforward expression.

Since we are hoping to fit presentations into the allotted time frame, your presentation's structure should include time checks to keep you moving through material at an appropriate pace. Be realistic when setting your pace for any given component (5 minutes is rarely enough to present a technical proof in its entirety), so use your time limitation to help structure your discussion. For example, if you only have 5 minutes to talk about a particular proof which would take 15 minutes to explain in detail, what are the essential things you need to convey? Might you instead present a reasonable skeleton of the argument, or is it better to give a more detailed analysis of just one component of the argument?

Once you have decided on the content you'd like to present, you should spend time determining how you'll convey that information, both verbally and on the board. I cannot overstate the importance of thinking carefully about precisely what you'll write on the board. Though it can be difficult to gauge how much to write on the board, here's a rule of thumb to keep in mind: if your audience writes down precisely what you have on the board in their notes (and nothing else), then they should be able then re-read those notes three weeks later and still understand the key points of your presentation. Just as you wouldn't write a proof and leave critical details to be filled in by the reader, you shouldn't leave your audience with the task of deciding what's worthy of writing down and what's not. It's hard enough to simply keep up with note taking while trying to think about the mathematics you're presenting; don't make your audience think hard about what they will or won't write in their notes. I strongly encourage you to get in the habit of writing your notes for the class "board style;" even writing on note cards with a felt marker can help you replicate the density of text that you can reasonably put up on the board.

Boardwork & Delivery. Ultimately the success of your presentation relies on your delivery. If you've put careful thought into the mathematical content of your presentation and how you plan to present it, then delivery should simply be a matter of executing your script (with occasional extemporaneous responses to audience questions). That said, there are certain habits you can adopt that will help guide you through some of the mundane tasks that can trip up an otherwise well-planned lecture.

- Don't speak at length without providing some written record of what you're saying. If it's important enough for you to talk about it for more than 30 seconds, then it's important enough to be on the board. (This rule doesn't necessarily apply when you're responding to a question from the audience.)
- Include critical "sign posts" in your board work. Lemmas, theorems, definitions, examples and proofs should be all be labeled as such on the board. The words "if" and "then" are essential in parsing the meaning of a mathematical statement, so don't omit them; in particular, don't use a comma to indicate the word "then." Quantifiers also carry a tremendous amount of the meaning of a mathematical statement, and they should be always be included.

- Make sure your board work is physically structured so that it has the same narrative flow as your presentation. This means that you should almost always keep writing from top-to-bottom and left-to-right. Don't go back to an old section of board to interject some new writing amidst the old. Mixing old writing with new is really hard for your readers to record faithfully in their notes, because it adds a temporal dimension to their writing which is hard to reproduce on paper. Equally important is to leave some written record of the narrative which connects various portions of your presentation.
- Split a large board into reasonably sized subpanels by drawing a vertical line (or lines) in the middle of the board. This has two benefits. For one, it makes it far more likely that you'll maximize your use of blackboard real estate. This means that your written work stays on the board longer before you need to erase it to make room for more writing, and this is always a good thing. The other benefit is it gives a physical structure to guide the "flow" of your presentation. You'll be able to easily distinguish old writing from new writing by keeping track of which panel is oldest, and this will allow you to erase the board without thinking too hard. Your readers will also be able to visually keep track of the order of your narrative, and this will make reading the board far easier for them.
- If you've got a result that you want to keep around for the whole of your presentation, write it on a part of the board that doesn't get erased. (Our room includes "side boards" that are good for this.) If you choose to do this, make sure that every time you reference the result that's written on the permanent board, you include a written reference to it on the board that's recording your current narrative. Don't simply point to the result and say "by the result on the side board," since note takers are less likely to put this in their written record of your lecture.
- When it's time to erase, choose the oldest thing on the board and erase with confidence. Well-organized boards rarely require you to make difficult, on-the-spot decisions about what to erase and what to keep on the board. Though it's fine to occasionally ask the audience if it's ok to erase something, you needn't (and shouldn't) ask their permission each time you pick up the eraser.
- If you're carrying out a calculation that requires a few steps to complete, break the equation across several lines. This will keep your board from getting too wide, and will also emphasize the step-by-step analysis you're giving the equation. When appropriate, you can also write out a brief parenthetical explanation of a given step on the far right side. For example, suppose we are told that G is a group and that $a \in Z(G)$, and we want to show that a^{-1} is in the center as well. Then one computes

$$\begin{aligned} a^{-1}g &= (g^{-1}a)^{-1} && \text{(by socks and shoes)} \\ &= (ag^{-1})^{-1} && \text{(since } a \in Z(G)\text{)} \\ &= ga^{-1} && \text{(by socks and shoes).} \end{aligned}$$

- Unless you're getting rid of something erroneous, do note erase anything you just wrote. If you do this, you're destroying the written record of the narrative you're conveying, and you're also asking the audience to make a hard decision about how to record things in their notes. Essentially the only time you'll need your eraser is when you're annihilating something that you didn't intend to write, or when you're wiping a board (or panel) completely clean to make room for new mathematics.
- Practice writing on the board. Anyone can get up at a board and write with chalk, but very few people can do it with ease. This is a skill that's relatively easy to pick up with a little practice.
- Make eye contact. Speak loudly, but don't shout. Be aware of whose view your obscuring as you stand at the board. Smile. Exude confidence. Gauge your audience's understanding and adjust appropriately. Think about how you can include audience participation.