

STATEMENT OF TEACHING PHILOSOPHY

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Mathematics shows how to find common patterns in seemingly disconnected events. All my mathematical activities in general, and my teaching in particular, are driven by this core realization. To me, mathematics is a whole. Thus the research I do as a mathematician, the lectures I present to my students, the discussions I have with them during my office hours, and the cutting-edge applications of mathematical research offered to industry are all part of a broad scholarly project. As I see it, mathematics is the unifying theme that underlies almost every human endeavor. When I teach mathematics, I am primarily motivated to help my students appreciate this role of mathematics as they learn.

I teach that the most important part of mathematics consists of its concepts. In order either to pursue mathematics for its own sake, or to apply its methods to other disciplines and projects, my students must study these concepts with the goal of internalizing them. For example, surface and volume integrals are important in pure mathematics as well as in engineering and the sciences. Trying to do them mechanically using antiderivatives and plugging in the values of the limits can often yield incorrect solutions in more complex situations. Understanding it in light of Riemann sums and the fundamental theorem of calculus, on the other hand, establishes a strong conceptual footing that offers greater ease in a wider variety of situations. However, sometimes it is hard to motivate students to understand these concepts, especially when they would prefer to use mathematics solely as a tool to be deployed in their own majors. The situation gets even more complex in classes where students come from a wide variety of backgrounds and majors, so that within a single room there can be a wide range of levels of mathematical sophistication. To tackle this diversity of background, I give my students a questionnaire in our first class meeting, asking them about their educational backgrounds and their familiarity with basic mathematical knowledge and terminologies. From there, when I start a new concept, I work to motivate students interest in the topic I am introducing, drawing on examples from their fields of study and interests to demonstrate how and where the concept can be applied. Next, I give students a problem that requires the new concept in order to solve, and ask them to see exactly where they get stuck as they work on it. This way, my students can develop an appreciation for why this new concept is needed. Finally, I introduce the concept with the formality appropriate to the level of the course, and move on with examples and problem solving.

Mathematical training must leave students ready to solve problems and apply the concepts and skills they have learned. Almost always, I first encourage students to try to solve any problem or example that I will cover in class. Even if nobody has a solution, I ask them to think over it and try to guess at how it should be solved. I give them some hints and guide them through trying again, preferring to give a complete solution only if these two attempts fail. For example, during problem session on convergence and divergence of series, students are always encouraged to find which of the tests of convergences are applicable to particular series in hand. If they fail to do so, I ask them to make “wild” guesses. To which students generally respond by trying to match the patterns of the series in hand with the patterns of the serieses relevant to different tests. Even if they fail, they come out with a better understanding of the tests. In order to encourage discussion and offer my students some agency in their own learning, I also occasionally set them up in groups to solve a set

of problems.

I'm a firm believer in the importance of constant interaction with my students, both in class and by email or by office hours. I actively encourage my students to ask me any questions they want about their work. Especially in the beginning of courses, I emphasize that no question is a "stupid question." As I remind them, continuing to ask questions until they have internalized concepts is a very useful strategy for developing mathematical understanding.

As an instructor I feel the need for periodic assessments to get an idea of students learning and improvise teaching accordingly. As different students respond differently to different testing methods assessing can be very tricky. Things get more complicated when I'm teaching a section of large class and the midterms, the final exams and regular homework are mostly standardized. I personally like to vary my mode of assessment. A combination of extra credit and challenge problems can be useful to judge which of the students are becoming capable of independent thinking over non standard problems. Quizzes of various format can also be very useful. One of my favorites is multiple choice quizzes where more than one or none of the options can be correct. In my experience, these types of quizzes at the end of the class can be very refreshing for the students, help them become more comfortable with test scenario and above all improve their understanding of the subject material.

I encourage my students to learn to use the same calculators and software packages that I depend on in my own research. Using calculators can help my students learn to develop their own intuitions about about topics that cannot be formally introduced in the scope of a particular course. For example, in a lower level calculus course that does not permit the use of epsilon-delta terminology, a graphing calculator is invaluable for explaining limits. In statistics courses, meanwhile, calculators and packages are extremely useful for graphically visualizing the data and their different statistics. I design class projects and group work for my students to actively engage with these tools.

As a researcher as well as a teacher I believe, every class I teach and every verbal or digital interaction with my students enriches my own mathematical scholarship. I look forward to teaching different mathematics courses, and interacting with new students and facing new challenges. In all these activities, I will always aim to convey the very spirit that I appreciate about mathematics, the field which once showed mankind that two seemingly different problems such as finding instantaneous velocity, and finding the tangent to a given curve are actually identical, if only we can recognize the pattern that links them.