This document outlines my teaching philosophy and experience. The interested reader may find copies of evaluations from students and from faculty on my webpage http://math.berkeley.edu/~poirier/Teaching.

My goal in teaching is to make math meaningful to my students. I was a student at an arts high school when I discovered that I liked math. My math teacher was an artist herself. There are two things that made her an effective teacher that influence me in my own teaching: her obvious love of the subject and her desire to make it meaningful to her students. Her approach was to combine traditional lectures and assignments with those that incorporated our artistic pursuits. For me, it was the first time math had been made so visual. This is what made it meaningful to me.

Communicating my own enthusiasm for math comes naturally to me because I like people and I like talking about math. My students indicate that this makes me approachable and observers of my classes remark that it makes me an effective teacher. Making math meaningful to my students can be more of a challenge and means different things in different situations.

Below, I describe three instances where I have focused my broader teaching goal to fit particular situations and outline other experiences I have found particularly relevant. I am happy teaching many different classes and most of my experience comes from from teaching freshman and remedial courses at the City University of New York’s Baruch College campus and upper-division undergraduate and graduate courses at the University of California, Berkeley.

Baruch College. At Baruch I taught between one and four calculus, precalculus, or remedial algebra classes per semester. There was no separate grader or teaching assistant so I was my students’ only point of contact with the class. I got to know them pretty well, especially during office hours. Mine was the first or last college math class many would take. This made it particularly important for their experience to be a positive and meaningful one. I learned from teaching these classes that people really like understanding things. Even the students who initially approached the material with anxiety or fear really enjoyed the feeling when something clicked. Naturally, this is one of the reasons I like studying math. While the underlying goal was to help these students get through the course, a more personal goal was to set up as many of these Aha! moments as I could.

To support this goal, my approach to setting up these moments in class is to adopt a relaxed lecturing style that requires significant class participation. Smaller class sizes allow for lessons to be interactive, like conversations between the students and me, but this approach can be modified for larger class sizes as well. I ask a question, either conceptual or procedural, and have my students toss out ideas or walk me through a solution. This can be as simple as their telling me which buttons to press on my graphing calculator. It can also be more involved. I find that appealing to their physical intuition helps when communicating abstract concepts. My favorite calculus lesson begins with the question, “You drove 60 miles in one hour. How fast were you going?” The question highlights the difference between average and instantaneous velocity and demonstrates the need for the question to be made more precise. We add some details to the trip (getting caught speeding, missing a highway exit, other misadventures) and then guess how a radar gun determines instantaneous velocity. The students quickly arrive at the idea of taking two distance measurements over shorter and shorter time intervals, even if they take a little prodding initially. One semester, a student immediately extrapolated a statement of the mean value theorem from this discussion! I find this to be an effective way to keep these younger students engaged. They are active in their own learning process and progress and they can feel it when something clicks. I get a sense of what they are thinking and when someone has come to an Aha! moment.

UC Berkeley, upper-division undergraduate classes. At Berkeley I have taught undergraduate abstract algebra three times. Some of my students are math majors and others are taking the class to satisfy a different program requirement. For many of them, this is the first class where they see proofs and are asked to prove results themselves. I want students to gain a firm understanding of the course content but, to make it meaningful, my goal is for them to come away with an understanding of what “doing math” means. Namely, we make precise definitions in order to capture some phenomenon that we see and want to explore. We use these definitions to make precise statements about the objects we’ve defined.

To support this goal, I use my office hours to complement my lectures. For me, there is a very social aspect to the process of “doing math” and office hours are the place where I can really get to know my students. My office hours are well attended and dynamic; I try to sit back and let the students do most of the talking. It is important that they feel comfortable talking with me and with each other even when their ideas are not yet fully formed. Sometimes making a student’s question more precise helps clarify understanding enough for the student to answer it himself or herself. This helps to reinforce the need for precision in doing math. Other times, a student
will ask for feedback on his or her own written proof and will present it to the group. The other students can offer advice on or criticism of the content or exposition, which can be extremely valuable. While I enjoy seeing these students make progress throughout the semester, the most rewarding part for me comes at the end. Quite often, it is the students who were most uncomfortable at the beginning, who persist and attend every office hour, whose final exam solutions are the most clear and most precise. This shows me that they have gained an understanding of and appreciation for what it means to “do math.”

**UC Berkeley, graduate classes.** I am currently teaching graduate algebraic topology for the second time. My students come from a wide variety of backgrounds. To make the course meaningful to them, my two goals are to present topics and techniques from algebraic topology that can be useful for the fields that interest them and to give them an idea of why one might want to become a topologist.

To support the first goal, I have students give presentations on topics related to the course and of interest to them. To support the second goal, I try to offer something the students don’t usually get from reading a book. Topology, for me, is extremely visual; it appeals to my background in art. I try to impart some of my own visual and geometric intuition to my students. I am never without my colored chalk and manage to draw a picture representing almost any argument. Homework assignments include open-ended exercises asking for students to rely on their own geometric intuition. This can be uncomfortable for some at first but before long they see the appeal of such an approach. I’d really like for all my students to want to become topologists themselves. This might be too much to ask so I feel satisfied if, by the end of the course, they can see why someone would want to become a topologist.

**Other experiences.** In addition to the above experiences, I have sought out a variety of opportunities to try to make math meaningful outside of the traditional course setting. As an undergraduate, my part-time and summer job was at Ontario’s Ministry of Education, where I worked on province-wide high-school math assessments. As an instructor at Baruch, I participated in a special program for students in their first semester of college. At Berkeley, I mentor both undergraduate and graduate students and I co-organized a week-long summer school for beginning graduate students. I describe a few other experiences in more detail here.

**Women in Science and Engineering, Stony Brook University.** I co-taught introductory mini-courses on the topology of curves on surfaces for women in their second semester of a science or engineering program. There were only five or six students in each class so desks could comfortably be arranged in a circle. Class meetings were very informal and consisted of guided discussions and “experiments” performed on models of surfaces made from paper. Once the students became accustomed to the format and content of the class, they were fully engaged with the material through these experiments. The goal of the course was to expose the students to something outside their standard math classes and my favorite part was the enthusiasm with which they approached the experiments. One time a student came to class with the results of an experiment she had performed on a giant Möbius strip she had constructed from a roll of gift wrap paper!

**New York City Public Schools.** Partly supported by an NSF GK-12 fellowship, I worked in collaboration with four math teachers in large public high schools in the Bronx. The exact nature of my role in each partnership was different, but I visited each of their classrooms weekly to be an extra resource for the teacher and for the students. They appreciated the extra support. For me, it was an eye-opening experience. While most of the students were as committed and as hard-working as their teachers, I would characterize the overall dynamic of the schools as chaotic. Students were sometimes placed in classes they weren’t ready for, simply to fill seats, while other classes were overcrowded. Teachers did not always have sufficient background for what they were teaching or sufficient support from their administration. Frequent commotions and distractions in the hallway during class time were usually minor but had the potential to become dangerous (students passed through metal detectors as they entered the building, but they described to me how easy it was to sneak in banned items). This gave me a much better idea of where my own college freshmen were coming from, not just in terms of their mathematical backgrounds, but in terms of their more general educational backgrounds. As a result, I make it much clearer exactly what I expect from my students and what they can expect from me.

**Ruth Asawa San Francisco School of the Arts.** I have recently started a collaboration with a math teacher at a local arts high school. She is also a painter and reminds me of my own high school math teacher. We talk about fostering her artistic students’ interest in math with supplemental learning material and I visit her classroom to meet with her students. There, I have shared how math became meaningful to me as an art student and how I went from art student to mathematician. I have also presented on my own work in topology. This has resonated with some of the female students, in particular, who are now interested in learning more math at the college level.