Teaching Statement

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1 Teaching Philosophy

My teaching philosophy rests on three principles:

1. Every student learns differently.
2. An instructor should be prepared to address any question students ask.
3. Teaching should not only explain concepts, but also motivate students to engage with mathematics.

I will describe how these principles have guided my teaching and mentoring experiences.

2 Teaching experience

2.1 Lower division classes

At UC Berkeley, I served as a Graduate Student Instructor (GSI) for a wide range of courses in mathematics, including calculus, linear algebra, abstract algebra, mathematical logic, and cryptography. While teaching these courses—especially lower-division classes such as calculus—I discovered one of the most essential lessons in mathematics instruction: *every single student is different*.

In the calculus sequence for biology majors (Math 10A/B), approximately 200 students were enrolled, and their opinions about the lectures varied widely. Some thought the professor explained concepts clearly, while others felt the pace was too fast. Some found the exams straightforward, while others found them challenging. It quickly became clear that it was impossible to satisfy all 200 students, given their diverse backgrounds. Some had already mastered most of the material in AP courses, while others were still struggling with preliminary concepts and notation. With four GSIs in the course, each responsible for two discussion sections of about 50 students, this challenge persisted.

To address this, I designed discussion materials at multiple levels so that every student could learn something useful. I regularly took questions from lectures and homework, ranging from basic to advanced. When answering simpler questions, I often created variations of the problem (e.g., by replacing fixed numbers with variables) or introduced related concepts not formally covered in the lecture. For students seeking greater challenges, I offered "coffee problems" to motivate them beyond the standard curriculum. Several students worked on these problems enthusiastically, and even though they declined my offer of coffee, both they and I were satisfied with the deeper engagement. (An example can be found in my blog post.)

During office hours, I was able to personalize learning more directly. By listening carefully to the way students phrased their questions, I could distinguish between those who had nearly mastered the material and those still working on foundational ideas. For the former, I skipped routine details and emphasized the conceptual challenges, saving time and giving them greater insight. For the latter, I focused on clarifying underlying concepts before tackling specific problems, often guiding them step by step until they were ready to try problems independently. When I could see that a student was prepared, I let them attempt the problem while I observed from behind, intervening only if they became stuck. This approach helped students build confidence and independence in their problem-solving.

2.2 Upper division classes

Upper-division courses for math majors differ significantly from lower-division ones. Most of the students were second- or third-year math majors, highly motivated and genuinely interested in the subject. Accordingly, I adopted a different teaching philosophy: my primary goal was to expose these young mathematicians to the broader landscape of mathematics.

For example, while teaching the concept of orthogonal operators, I introduced Fourier series and explained how function approximations can be understood as orthogonal projections in linear algebra. When teaching abstract algebra, I brought a Rubik's cube to class and illustrated how the impossibility of solving a cube with one edge piece flipped by using only simple moves is related to the parity of permutations in the symmetric group. These demonstrations sparked active participation and engagement from students.

When reviewing quizzes or exercises, I avoided merely presenting solutions. Instead, I encouraged deeper thinking by posing variations on the problems, typically beginning with the phrase "What if…". This strategy pushed students to generalize ideas and recognize underlying structures, rather than memorizing a single method of solution.

During office hours, some students often asked broader questions about pursuing a career in mathematics, whether in academia or in industry. Drawing on my own experiences in both settings, I was able to provide them with practical advice and resources. For students interested in graduate school, I shared perspectives on how to prepare for advanced study, select research areas, and build strong applications. For those considering industry careers, I emphasized the wide applicability of mathematical training in data science or finance. These conversations reminded me that teaching is not only about conveying course material, but also about mentoring students as they explore their long-term goals and identities as mathematicians.

In addition, I have had opportunities to give guest lectures when instructors were away. For an undergraduate cryptography class (Math 116), I lectured on Zero-Knowledge Proofs. In a graduate number theory course (Math 254A), I delivered two lectures on SageMath and on machine learning applications in number theory. These sessions were well received by students, many of whom asked thoughtful questions during class and even followed up with detailed emails afterwards.

2.3 Student evaluations

I have compiled excerpts from end-of-course student evaluations for the courses that I have taught. I was honored to receive the Outstanding Graduate Student Instructor award in 2024.

- [Math 53, 2022 Fall] I have been to other math 53 GSI office hours and some of them get stumped and don't know what they are doing. Seewoo never gets stumped and actually prepares himself to answer questions effectively.
- [Math 10A, 2023 Fall] His preparation and organization is impressive I believe that he would be a great professor one day (he could be one right now) he explains really patiently, he is always on time and with a great attitude, he encourages us to ask questions, he sis always open to schedule more office hours if we need them. He responds pretty quickly to our emails and always with a positive attitude toward the course. He explains the importance of the topics outside the course environment. In 10 min he can make you understand a whole topic, and he wait patiently for you to ask questions or process the information (you feel supported and with some hope for the course). He always has worksheets for discussion and answers them with us at the end of the section, and during discussion goes oven questions in the homework, pass midterms, or any question that you can come up with.

- [Math 10A, 2023 Fall] Willingness to answer any question, great attitude towards students, extremely patient when explaining topics. The preparation with his worksheets were amazing and very well thought out. Seewoo clearly spent a lot of time dedicating to this course and to our discussion section, and he was very understanding with all of his students. His office hours were also very welcoming and he was extremely approachable as a GSI.
- [Math 110, 2024 Fall] I think he did a great job explaining each of the topics that we went over class, making sure that we knew what were going over and also sending us a summary of the topics that we learned in order to make sure that we could easily review specific concepts.
- [Math 125A, 2025 Spring] Seewoo is incredibly knowledgable, always helpful, and very patient with students. More so than course–related topics, he is open to advising students on other topics in mathematics, like independent research/career advice.

3 Mentoring experience

Beyond my work as a TA and GSI, I have also mentored students through research programs such as the Berkeley Math REU and the Directed Reading Program (DRP).

In the summer of 2025, I mentored four undergraduates in the Berkeley Math REU. Each graduate mentor designed a topic, and while the main goal was to give students a taste of research, I hoped to push further and guide them toward proving new theorems. After much consideration, I chose function field arithmetic, which balances accessibility with reasonable open problems.

At the start of the REU, I focused on figuring out each student's strengths. Some are good at programming, while others preferred reading papers or working through theory. To match their interests, I proposed two projects: one on Diophantine equations for Fibonacci polynomials over finite fields, and another on Chebyshev's bias in function fields. With only rough outlines in mind, I encouraged them to experiment with SageMath, from which they discovered patterns and formulated conjectures. I then provided further background readings and guidance, and by the end of the program we had proved several new results. We are now preparing two drafts for submission. This project also motivated my own research, leading to an independent paper on Shanks' bias in function fields (a higher-order version of Chebyshev's bias).

I have also mentored five students through Berkeley's Directed Reading Program. DRP pairs undergraduates with graduate mentors to explore advanced topics outside the standard curriculum, culminating in student talks or short papers. Instead of assigning my own interests, I introduced students a list of interesting theorems and let them choose what intrigued them most. For instance, one student selected Monsky's theorem, which states that dividing a square into triangles of equal area always produces an even number of triangles. Though the statement seems combinatorial, the proof relies on 2-adic valuations (and combinatorics). We spent the semester studying p-adic numbers through Koblitz's book, and by the end the student understood the full proof. Other mentees explored topics ranging from elliptic curves to modular forms.

4 Conclusion

Being a good mathematician is not my only goal in life. I also strive to be a dedicated *teacher*, inspiring as many people as possible to appreciate and enjoy mathematics. Equally important to me is guiding and training the next generation of mathematicians. I believe my teaching and mentoring experiences demonstrate my commitment to these goals and reflect the progress I have made toward achieving them.