TEACHING STATEMENT

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My name is Ryan Holben, and I received my Ph.D. in mathematics from the University of California, Irvine in 2013. I have been teaching for over seven years, and have considerable experience and success as both as the instructor and as a teaching assistant for many courses. My teaching experiences have been very enjoyable, and I am excited to continue teaching in my professional career.

I began my teaching experience in my senior year as an undergraduate student. One of my professors asked myself and another student to be teaching assistants for the school's honors calculus course. My duties were to coach the class in problem solving, proof-writing, and to help with grading. Additionally, the course taught many interesting upper-level topics such proof techniques, analysis and topology, ensuring that my first teaching experience prepared me for a wide variety of courses.

Since coming to UC Irvine I have become very involved with teaching. In the lower division courses, I have been a teaching assistant for most of the calculus sequence, among other classes. I have been a teaching assistant for the complete first year calculus program many times, so I have a good idea of what works when teaching students from a wide variety of majors. I have been an upper division teaching assistant for a number of courses as well, from the introductory proof-writing course to analysis and graph theory. In all of these classes, my primary duty was to lead discussion sessions several times per week, during which I do problem solving, answer questions, and in general try to provide my own lesson plan with examples that complement the professor's lecture, providing a more thorough understanding of the material. Almost every one of these classes also required that I wrote quizzes, and helped grade homework, quizzes and exams.

I had a particularly involved role as a teaching assistant to our proof-writing course. At the time the course was being taught by a different professor than usual, and she wanted to take the opportunity to re-evaluate the curriculum. I offered my help, and we worked for many hours to produce a quality course. Although the class is primarily for teaching proof-writing, it is also an introduction to many miscellaneous concepts which are needed later. I drew from my experience with upper division students who had already taken the course to help evaluate what subjects needed more or less coverage. For example, I pointed out that all upper-division courses in our program assumed but did not teach knowledge of cardinality, but our course's curriculum didn't include formal coverage of it. With that in mind we added several lectures and discussions, as well as homework, quizzes and exam questions that covered the new material.

In addition to my roles as a teaching assistant, as a graduate student I was the sole instructor for pre-calculus, integral calculus, and linear algebra & infinite series. During the past year since I received my Ph.D. I have taught differential equations, math for economists, and I am currently teaching several sections of integral calculus. Each of these experiences has been unique for me. The pre-calculus course was through an online system called ALEKS, and I learned what it takes to teach an online course effectively. I gained a lot of experience teaching via online whiteboard and voice chat applications. The linear algebra &

infinite series course was taught over a short summer session, and since the class teaches two disparate subjects I was under strong pressure to get through each one quickly. Because of this I learned to distill the most important information when creating my curriculum. I also wrote all of my own exams, practice exams, as well as chose problems for homework assignments. I found that choosing homework problems was actually an interesting challenge. I had to come up with assignments that gave enough practice in all of the important topics, while at the same time not being unreasonably lengthy. The same could be said for the exams themselves, and I think that I was able to find a happy medium in this respect. The first time I lectured integral calculus, my students averaged significantly higher than the other two sections of the course in the common final exam, including one section taught by a seasoned full time lecturer. As this was my first experience as being the sole lecturer for a class, I considered it a great success and I was very proud of my students. Both differential equations and math for economists were populated by non-math majors, providing unique challenges. The former class had mostly freshman students, whereas the latter had a range of mid-level to fairly advanced students. Consequently each course required very different approaches. For example, while teaching differential equations I had to be very careful about what proofs I chose to give or omit, so that I didn't alienate students who tend to zone out during proofs, and so that I didn't make the advanced students feel as though their time was wasted.

At the end of the 2011-2012 academic year, I was awarded the Outstanding Mathematics Teaching Assistant Award at UC Irvine. I was nominated for the award because "Ryan has an overall outstanding attitude towards his teaching. He is enthusiastic and has a real interest in the success of his students. Students enjoy taking classes with Ryan because his positive attitude makes it easier for students to get excited about the course material."

This quote serves as a good introduction to how I like to teach. I think that as educators we have to be aware that for many students there is a stigma associated with mathematics, in which it is believed that math is difficult and unapproachable. I firmly believe that mathematics does not have to be difficult, and it is this fear that makes it unapproachable for students. Therefore when teaching I do my very best to make the subject material seem logical and straightforward. For example, when working through a proof on the board, one could just write the solution from start to finish. However, I prefer to teach the class not just the steps, but the thought process that I personally do when coming up with each step. This makes the solution seem less like magic and more like something the students could thing of themselves. Teaching particular proofs is secondary, my primary purpose is teaching students how to come up with their own solutions.

The reason for this philosophy is simple. For example, if someone shows you how to paint a flower step by step, then you may be able to replicate it and make your own paintings of that same flower. However, if you are instead taught the fundamentals of composition, colors, perspective and so on, then you can paint many different subjects in addition to that flower, in your own style. If I can teach students to be critical thinkers and problem solvers who can find their own approaches to problems, then I will have helped produce much higher-quality mathematicians.

As an example of guiding students towards understanding, rather than simply lecturing, I would like to refer to topology. When teaching metric spaces, I gave the class the problem of building their own metric on functions on [0,1] by integrating. Through their own examples, they discovered why they had to restrict their metric to C[0,1], and in doing so I believe they gained a far better understanding than if I had simply

defined the metric for them.

When I teach, I always try to think, "What would I like this class to be if I were taking it? Is this a class that I would find interesting enough to be excited to attend? How much would I be learning, and is the lecture easy to follow?" With this in mind, I have always tried to emulate my most influential professors while still taking my own approach. Like these professors, I try my best to make mathematics intuitive. When many students see a definition, a theorem, or a problem on the board or in the textbook, they tend to draw a blank. So if I am stating a theorem, for example, I alway first write it out in math language, and then I try to translate it into plain english, or something close to it. I then give a simple and demonstrative example of what the theorem might say about a familiar object or situation, if possible. Also like my previous professors, I try to make class very interesting and fun. After going through standard examples of some new concept, I'll go through very unusual examples that they might not normally see. This is usually pretty interesting, and often I can use this to tie the course in with other classes they might be taking.

I believe that I am very successful in my approaches to teaching. I consistently get very good reviews by my students. For example, a student in my linear algebra & infinite series class wrote: "He is knowledgeable enough to be an instructor himself. Has well formed concepts of the math we are learning and is capable of explaining them in a coherent manner. He always seems to be in his comfort zone and is very professional in how he handles the class. He is very receptive to questions and actually prepares the classes beforehand. His method of going over examples is extremely good. He also finds a way to tie an entire lecture together, which is really pretty awesome." Another comment which I feel is representative of the reviews I get is: "Gives tons of examples, goes over everything more than enough, makes the class interested and makes us comfortable enough to ask questions. Discussion is the reason I succeeded in this class." One student wrote about my integral calculus course lecturing: "I've taken a few calculus courses, and this teacher is, by far, the best. I never understood calculus as well as I do now."

During my last year in grad school I co-taught special monthly outreach classes for high school students, under the NSF RTG grant. We have interested students from area high schools visit the university to take part in a half day series of workshops. By being led through fun activities such as building matchbox computers and playing a very simplified version of chess, students are introduced to game theory and group theory. By doing so, they see that there is much more to mathematics than basic algebra and crunching numbers. We then bring in a panel of undergraduate math majors to talk to the students about life at UC Irvine, to get them excited about the prospect of going to college.

Lastly, research is a critical part of what I do. I do research in set theory and I am very passionate about the field. I would very much like the chance to design and teach a set theory course at some point in my career. Additionally, I know how important it is for prospective graduate students to begin research early, and so I would enjoy the opportunity to guide one or several undergraduate students through some introductory research.

It has made me very happy to be making an immediate and noticeable difference in the academic side of so many students' lives. I have really come to love teaching during my time at UC Irvine, and I truly hope to be able to continue doing so.

List of Courses Taught

- Lecturing at UC Irvine

1. Math 1B - Pre-Calculus
2. Math 2A - Differential Calculus
3. Math 2B - Integral Calculus (currently teaching)
4. Math 2J - Linear Algebra & Infinite Series
5. Math 3A - Introduction to Linear Algebra
6. Math 3D - Elementary Differential Equations
7. Math 4 - Math for Economists

- Teaching Assistant positions at UC Irvine

1. Math 2A - Differential Calculus
2. Math 2B - Integral Calculus
3. Math 2D - Multivariable Calculus
4. Math 2J - Linear Algebra & Infinite Series
5. Math 4 - Math for Economists
6. Math 6B - Boolean Algebra & Logic
7. Math 8 - Explorations in Functions and Modeling
8. Math 13 - Introduction to Abstract Math/Proof-writing
9. Math 121A - Linear Algebra A
10. Math 140B - Real Analysis B
11. Math 141 - Introduction to Topology
12. Math 174A - Modern Graph Theory A

- Teaching Assistant position at Colby College

1. Math 161 - Honors Calculus