TEACHING STATEMENT

REID BUCHANAN

I've always had an interest in math, so I almost expected to go into research from the beginning. Something I discovered along the way was an additional passion for *communicating* mathematics. While in undergrad, I found myself watching YouTube videos—from channels such as Numberphile and 3blue1brown—about popular topics and "interesting math facts" to learn about a special insight I had never considered before. So many incredible concepts often appear incredibly complicated the first time a student learns about it through a terse, dry definition or a vague, unhelpful description that not only impedes further development of the subject but serves as a missed opportunity for the student to understand and appreciate the full picture.

Mathematics communication is an art that should not be treated lightly. As I prepare lectures, I consider how my words and supporting visuals are received by students, and I spend extra time carefully crafting these explanations to minimize confusion and ambiguity. This is especially true when I introduce concepts, as the students' first impression is the most important. I recognize the limitations of the traditional classroom format and look for ways to counteract them such as encouraging students to come to office hours for more individualized discussions as well as showing them how to properly absorb and study for understanding of mathematical concepts.

I have been the instructor of record for my classes since 2020. I write my own lecture notes and materials, design my own quizzes, and assign my own sections' homework. These sections were coordinated, which has also given me opportunities to help drive the entire course and make decisions as a team, such as creating problems that appeared on exams and regularly offering input on both exam and homework problems. Although most of my experience in teaching so far comes from coordinated courses, I am given much freedom in designing my sections how I want. As a result, I consider myself to have experience in teaching independent courses, and I am open to trying different styles of curricula.

I started out my career with some very unique teaching challenges! My first semester as an instructor of record was the Fall of 2020, during which was Oklahoma State's initial attempt at directing traditional classes through the COVID-19 pandemic. My only experience in teaching thus far had been as a recitation instructor-turned-grader in the prior semester. As a result, I faced a much steeper learning curve than ordinary circumstances. For example, I organized my presentations to serve three different audiences: students attending in-person, students attending the lecture's live stream, and students watching a recording of the steam some time later. Whenever the hastily-arranged technology malfunctioned, I resorted to a suboptimal Plan-B.

Much of my class management did not feel as successful as I would have liked. Despite this, I was able to keep track of what went wrong under my control and learned from my mistakes ahead of the following semester. In Spring 2021, I found better ways to explain the material and manage my timing. I was able to accommodate the students without letting

the pandemic overwhelm me. In stark contrast to the previous semester, I received multiple positive comments from students in private chats during the final exam stream, including one that read:

> I just wanted to say thank you for an amazing semester. This was one of my favorite classes. Before this class, I was starting to hate math. Your teaching changed my mind and made me love math again.

Over the years since, I have developed several visualizations and animations using the online graphing calculator Desmos and Microsoft PowerPoint, tailored to my style of teaching. Each time I notice a particular concept or example that is difficult to describe using static text and drawings, I make a visualization to use for future semesters, growing my collection. One example (available at https://www.desmos.com/calculator/81b60442f3, and among others at https://reidbuchananmath.github.io) involves two traveling dots—one red and the other blue—whose respective velocities are described by a complex red graph and an approximating piecewise-constant graph in blue. When I control the step length for the blue graph, the position of the blue dot increasingly mimics that of the red dot until they are virtually indistinguishable, but with the added benefit that I can calculate the blue dot's position using a Riemann sum.

Now, we can move to the whiteboard to discuss precisely what this exercise does, leaving the visualization up on the side to ground the students throughout our computations. I like to use these animations in tandem with the classroom's whiteboard, if the classroom layout permits, so that I can show students the underlying ideas on the projector *while* we work out the problem formally on the whiteboard for introductory examples and *after* the whiteboard work for subsequent examples.

I am mindful of how students receive my material and this extends to accommodating disabilities my students may have. While I color-code my animations and board work, I choose colors—usually red and blue—that are easier to distinguish for people with many forms of color blindness. When I upload images in announcements or for online assignments, I include alternative text. I have also adapted my board lectures and assignments to be lighter on symbols based on suggestions provided by students with dyslexia.

My assignments typically start out as formative assessments that encourage students to attempt the problems and correct anything that may go wrong. These normally take the form of regular assessments with multiple attempts per problem and iClicker poll sessions during class where half of the credit is awarded for responding and students receive immediate feedback. I will then follow these up with summative assessments in the form of short weekly quizzes taken in class, that communicate to me how well my class handles various concepts. I give each of these quizzes a smooth difficulty gradient to properly assess each student's skill level.

I concentrate more on how the students receive my teaching than how I choose to teach. This extends beyond the classroom, into assignments and review material. I learn a little more about how my students learn each semester, so that the following semester I can apply what works and take out what does not.