

Multivariable Calculus – Summer 2016

During the summer of 2016, I was assigned to teach a section of Rutgers' Multivariable Calculus class. While the course is necessary for mathematics majors, the majority of the students that tend to take the course are looking to go into engineering; as such, I taught the course with an understanding that the bulk of my students were focused on learning the material for the purposes of application. This did not require abandoning the notion of introducing topics as things that could be derived from base principles – rather, it meant recognizing that my students' interest in the underlying concepts would primarily be founded in making the ideas that they related to easier to remember and mentally access.

A typical lecture for the class would start with me giving an overview of the focus of the day's lecture, and the sort of problems that we could use the concepts on. I would then begin talking about the topic in more detail, going through the information from the textbook and talking about where the ideas within came from. Often, I would have an example system (such as a function, a parametric curve, or a gradient field) for the initial part of the class that I would use to demonstrate my points visually as I talked about them. Afterwards, I would do a number of problems on the board, each one emphasizing a particular point from the textbook; these would increase in difficulty as the lecture went on. During these problems, I would often stop and let my students suggest the next step, with some guidance from me in the form of a leading question. Since I knew that a large portion of my students were in physics or engineering, I also made connections between the material and phenomena in the physical world, to give my students a connection to what we were learning.

One thing that I emphasized in homework was the importance of practicing problems in order to reinforce the techniques. Each week, I would assign about twelve practice problems from the textbook for homework, generally focusing on the application of the core concept in particular techniques. I also worked to make myself very available for asking questions. I had my office hours immediately after lecture most days; frequently, students would come to me after lecture to ask questions, and for the more involved questions on the material, they generally walked with me to my office to ask the questions. Most days would have two or three students coming to my office hours, with more coming in the days before an exam. The majority of the students in the class took advantage of this at some point.

Overall, my students' performance was strong – the average score on the final was high, and the final grades were nearly uncurved. My students had positive experiences as well – of the ones that responded to the instructor evaluation surveys, two-thirds strongly agreed that I had a positive attitude toward assisting all students in understanding course material, and over 90% rated my teaching effectiveness as good or excellent. Some selected responses from my students are as follows:

- “It's been really interesting applying things that I learned in my past two calculus courses to 3-dimensional space. I've also immensely liked being able to think about how the math applies to physics even though this isn't a physics course (many thanks to Mr. Chiarelli for answering my questions about these things!).”
- “The professor made the class fun and the exams were straightforward.”
- “Despite being a summer course that was taught at an accelerated pace, the course did not seem rushed. The time spent on the material was reasonable.”
- “Professor Chiarelli was extremely helpful with answering and explaining questions in detail. He was also very generous with his time outside of class even when there were no set office hours.”
- “This course made me interested in math again after I lost interest in. It was fun and It is very practical. “
- “The instructor was good at teaching the material and was always there to answer any questions we had.”
- “Thanks John for helping us get through this course and being a patient teacher.”