TEACHING PHILOSOPHY

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I look forward to the gratifying feeling I achieve when I successfully empower math students through my instruction and this is the main reason I want to teach mathematics. When I go into an undergraduate classroom to teach, my goals include 1.) to assist students in building content knowledge, 2.) for students to experience the process of conjecture, experimentation and proof, and 3.) to describe a real life process—namely, one that the student is familiar with—and describe that process mathematically.

One of my teaching strengths is in my understanding of diversity. I have experienced first-hand what it means to have big gaps in my content knowledge as a result of low-income urban public schools and what it takes to overcome that challenge. I understand that my audience—my students, come from diverse backgrounds and it is reflected in my teaching. I have come across freshmen university students under transition to their university who are not prepared for freshman calculus. These students find difficulty with concepts such as "order of operations," and arithmetic with fractions and exponents. Thus, when it comes to math preparation courses, my priorities include 1.) detecting and filling gaps in students prior math knowledge, 2.) developing basic arithmetic skills, and 3.) motivating students to *make an effort* to learn mathematics. Some students find it difficult to stay motivated to learn, so one of my strategies includes teaching students to work collaboratively.

I reflect the belief that mathematics education should depend on the personal goals of the student. Hence I assist students as they develop to their fullest potential by preparing students to apply math tools in situations relevant to the students' discipline. This varies from humanities majors, to physical science majors and mathematics majors, to graduate level mathematics and it depends on the course I am teaching. **I prepare clear lectures that model the critical thinking process and facilitate the acquisition of life-learning skills.** I certainly enjoy teaching differential, integral and multivariable calculus because of the ample applications to various disciplines.

The math course I most look forward to teaching is differential equations. There is a wealth of physical phenomena modeled by a differential equation and this is an opportunity for students to bring together their knowledge of calculus and linear algebra to build their own mathematical models. One notable instance in a differential equations class is when students realize the role computers play in approximating solutions to differential equations through simple algorithms such as Eulers Polygon approximations. This is an appropriate task that I ask students to complete using Mathematica. However, my favorite moment in a differential equations class is enabling students to discover the general solution for a second order linear differential equation with constant coefficients. This is something that I ask students to do in small groups—time and class size permitting—but it may be done

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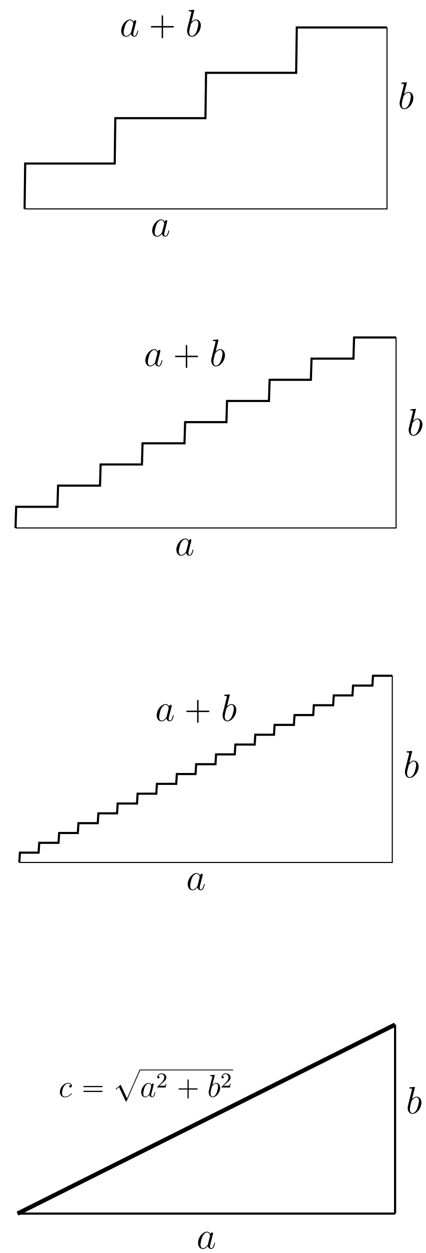
in a large group lecture, or in an office hour setting. I encourage students to experiment with different types of functions, that is, make an *ansatz*, and **experience the process of conjecture, experimentation and proof.** I point out that this procedure is one that is re-visited in higher mathematics courses and is a process I use when I conduct my own research.

When I reflect on my experiences as an undergraduate student, I recall a truly excellent math professor—now, my mentor and still my hero—who creates intrigue during lecture by telling applicable math allegories (I tell my own students about the king who loved chess, which is posted on my website) and fables. These stories and examples extend beyond the textbook and are similar to solving a mystery.

For instance, most of my undergraduate students remember the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are the lengths of the sides of a right triangle and c is the length of the hypotenuse. If you envision the hypotenuse of the right triangle as a staircase instead, the length of the staircase is equal to $a + b$. But as the steps become infinitesimally small, in the limit, the length of the staircase appears to be equal to $a + b$—*however, it does not*— the limit is the hypotenuse and it satisfies the Pythagorean Theorem. That is, $c = \sqrt{a^2 + b^2}$, and not $a + b$! The pictures to the right depict what I am describing.

I enjoy bringing this to the attention of advanced students who are curious about higher mathematics. The curves in the sequence made of the staircases become 'close' to the diagonal but, in the limit, the length of the curves does not converge to the length of the diagonal—in fact, the points of the staircase where the curve is not differentiable causes a problem. This creates rich dialogue amongst students and an *intrigue* in mathematics, which in my personal experience, motivated me to get a Ph.D. in mathematics.



"Mathematics knows no races or geographic boundaries; for mathematics, the cultural world is one country."—David Hilbert.