

MATLAB IN CALCULUS I, WHY NOT?

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For years, technology has been used in first semester Calculus (Calculus I) courses to help with computation and visualization of mathematical topics. The most common technology, which has revolutionized the method in which Calculus I has been taught, is the graphing calculator. Functions can now be plugged into a machine and visualized, roots of a function can be zoomed into, and derivatives can be calculated symbolically. While the graphing calculator has done wonders for Calculus I pedagogy, I believe it is time to take a step forward with the technology used in Calculus I. Both industry and academia have started to use Matlab to compute and visualize mathematics. Therefore, I believe it is essential that students learn Matlab as early as possible. In addition, Matlab can do everything that a standard graphing calculator can do while also being able to run programs. Thus, students get the benefits of visualization and computation, while also learning basic programming skills.

Matlab – short for **Matrix Laboratory** – is generally associated with Numerical Analysis or Linear Algebra. However, mathematicians in other fields, scientists, and engineers have also found Matlab to be extremely beneficial. In fact, Matlab produced figures have become the standard for most scientific journals and books. This dependence on Matlab across a variety of fields is one of the main reasons why I believe that students should be introduced to Matlab early, such as when taking a Calculus I course.

Many topics introduced in Calculus I can come alive with Matlab. For instance, one of the first topics that come up in class is functions. The first assignment that I give my students is to plot a picture in Matlab using different transformations of common functions. This assignment turns out to be a fun creative first project for the students, and at the same they learn how to use Matlab. As the semester progresses, I give them more challenging Matlab assignments that illustrate the topic being covered in the course. For example, when learning about integration, the students are asked to approximate integrals by writing a Matlab program to calculate Riemann sums. These assignments benefit the students in at least two ways: first they learn the Calculus topic through a different perspective, and second the students acquire basic programming skills.

One of the main concerns for teaching Matlab in Calculus I is the programming. I have found that the students' initial frustration with programming is just intimidation. However, once they get over their initial opinions on programming, they have a pretty high learning curve and some even begin to learn to enjoy programming. In addition, from the applied assignments, they understand how beneficial and essential

Matlab skills are in the modern math and science world.

In summary, my talk will concentrate on the different aspects of using Matlab in a first semester calculus course. I will talk about the advantages of using Matlab over other technologies to teach Calculus I. In addition, I will present some examples of Matlab projects I have assigned my students and will conclude with an assortment of reactions from the students who have taken my Matlab based Calculus I course.