**Reasons to learn Calculus (sharing wisdom)**

By: Paul Konichek

After 39 years of teaching High School Physics, AP Physics, Mathematics (taught all math except Calculus), and Computer Science (including Programming in two computer languages) I have had these insights:

1). From Physics I learned that anytime you graph your data (whether distance/time, velocity/time, amount of stretch/weight (Hooke’s Law with springs to obtain the spring constant), etc. AND this applies to all disciplines (Biology, Chem., Natural Resources, Economics,) one is interest in finding the slope (the 1st derivative).

2). High School Math like Geometry allows you to calculate Areas/Volumes of nice figures like rectangles/boxes, circles/spheres, pyramids, etc. but I’ve had groups of Pre-calc. students find the volume of strange vases brought in from home using the Calculus taught at the end of the Pre-calculus class. Meaning one can calculate the Area/Volume of any weird shape. (Not limited by shape.)

3). Dimension wise I notice that the derivative takes you down one dimension but the integral takes you up one dimension. Example: the derivative of the Volume of a Sphere 4πr3 / 3 gives you the Area of a Sphere 4 π r2 but if you integrate 4 π r2 you obtain 4πr3 / 3. Another way to say it is that you go down powers when you take the derivative but up powers when you integrate.

4). None of my family saw at your age where a college education was going to take but if it wasn’t for the college education my wife (General Science Major/ only needed Calc. 1 for her Physics minor) would not be a Project Manager handing million dollar savings projects for her company, my daughter wouldn’t be in charge of an electron microscope lab for the Science Department at the University of Texas (Marine Biology Major/ reluctant Chem. Minor) and my son is currently a professional tutor in silicon valley California (certified tutor 28 different High School & College courses and making $50 - $100 per hour) while waiting for his significant other to finish a PHD in Clinical Psychology and looking for a PHD/MD program in Economics in the area (Economics/Mathematics double major). The point is that you cannot foresee where a college degree will take you at this point in your life but I promise it can open doors that could NOT be opened without it.

5). The farmer I worked five summers (board/room) for always said, “Junior (could never remember my name); you can either use your head or use your back.” My family was very poor and I am the only one of the five that went to a University. My dad was a carpenter so my destiny was a small farm or a trade. I am not saying there is anything wrong with these trades only I could not have done the things I’ve done (worked for NASA, climbed mountains all over the world, taught Astronomy at the Air Force Academy, affected the lives of thousands of people for the better by teaching the above courses in grades 7-16 for 39+ years)

6. The problem with teaching mathematics in general (including Calculus) is that the instructor has to cover so very much math material to get you ready for the next course up in any discipline (like a math course required for Physics, Chem.) and they do not have the time to take to show how it will be used by you in the future. After all, we cannot predict what discipline you’ll use the math in and life is not long enough to show you how to apply it to all disciplines. So… we do have time to teach you the basics so when you become what you become you have the tools you need to apply math to your discipline.

7. The way I explained it to my Astronomy students through the years is that I learned mathematics so I could apply it to Physics and then I learned Physics so I could apply it to Astronomy. That is where mathematics took me…math can take you down any one of billions of roads but without math a large percentage of those roads will be closed to you.

8. Within a day of obtaining my MEPD (Masters of Education Professional Development) the University called me to teach computer science classes in the evenings after teaching high school all day. I told them I knew nothing about computer science but they said they knew I could figure it out fast enough to stay ahead of my classes in two different towns (WI Rapids, Adams/Friendship). Within a few years the University had paid me more for teaching for them than the tuition I had paid to get both my B.S. and MEPD degrees. The degree opened that door and may I add; opened the door to teach this class. Note: I told the UWSP Math Department Chairman that I’ve never taught Calculus before just like the Computer Science gig above but that doesn’t matter as my degrees show I am more than capable of the thinking required to handle teaching Calculus.

9. My college degrees have opened so many more doors for me that I don’t want to bore you with more of them now but hindsight has proved to me that a college education paid off in so very many ways. I have often looked back at when I was a freshman in college (1970, no computers (slide ruler)) and living in my half of the dorm room that I could not see where my college courses were getting me. It seemed like just more general education and I was so frustrated my 2nd semester sophomore year that I walked downtown to enlist in the Air Force (I wanted to fly those jets) but the recruiters were out to lunch so I stuck out college. My Calculus ONE teacher was the worse teacher in the world (found out years later that he was going through some really hard times) and my class of thirty some dwindled to six students by the end and I had the highest grade of a C-. Not a great start to a being a math major. Stick education out, it will be worth it in countless ways in the end.

10. Of the dozens of math classes I’ve taught through the years, Calculus, by far, I consider being the most worthwhile. All the other math courses I’ve taught were to get my students to this class. Those who could not handle the self-discipline it takes to get this far have dropped out and closed the many doors that will be open to you. From my NASA work, AP Physics work (many of my students are already engineers), Computer Programming work, my wife, daughter, son-in-law (Electrical Engineer, one of the best in the world at it), son, nieces/nephews; are all living proof that a college education pays big dividends latter but none of us could foresee the future when we were actually where you are at now. Hang in there and care about education. Education is your main job currently.

11. All through my life I have been working at making my weaknesses strengths. I was a D- math student K-8 and choose math as my college major. I was scared of shots (needles) and the next time I donate will be 200 pints (goal set at age of 30 of 256 pints). I was scared of heights and now have been to the summit of many of the worlds’ highest mountains. I was scared of water (swimming) and now I swim at least a half mile three times a weak. I was scared of Calculus (didn’t realize that our huge Calc. textbook was for all three Calc. courses) and for the first time I have the opportunity to teach it and I am really excited about it!

Thanks for reading the above and I hope that if even one thing I mentioned above helps you want to work harder at your education at this point in your life it was well worth my time to type it up.

I am in my office usually from 9 am till 2 pm Monday through Thursday (except for our class time) if you wish to talk or get some help in any way. I am here for you.