Math Diary

By Ethan Insler

When signing up for this course, I knew it would be challenging. After breezing through two years of calculus in high school, I wanted to increase the intensity in my math classes. Watching 3Blue1Brown YouTube videos, learning about complex mathematics and mathematical concepts allowed me to see the depths of math, and what I wanted to learn more. While I am accomplishing this in Honors Single Variable Calculus, I am also being challenged. I haven’t written proofs since freshman year of high school, so having to convert my brain from thinking in solutions, to thinking about the proofs behind the solutions was difficult.

On our first class we jumped right into the material. Learning Peano’s Axioms and expected to quickly turn that recently learned information into sound and understandable proofs. Trying to prove that 1≠0, having to prove addition in terms that I have never seen before - n∈N, 0+n=n, S(o)+n=S(0+n) – or learning what induction was, made it hard to hit the ground running, it felt like I was being dragged through the ground at 100 miles per hour.

Having to take every step back from what we know was strange, not assuming we know addition, subtraction, or what numbers even are. Not being able to know if negative numbers exist until we have proven Z by proving that N exists. Then quickly moving to the next subject two days later expected to have mastery of the axioms and the several definitions that we had learned, and having to gain the ability to build off of them was immensely challenging. I persisted, nonetheless. I spent hours in Brody, go over Analysis 1, learning how to understand what we had learned in class. Once achieving an understanding, I was finally able to contribute to the class. Answering the easier questions asked and being able to input my thoughts into group discussions.

After fighting to understand the axioms, the next complicated topic that I had issues with was property functions. I am still unclear on what the extent of them are used for. I understand why they are used and how, but I feel uncertain about applying them in problems. When they sprung back up in power sets in the example: construct- {Y : Y⊆X} = power set of X, by showing Y ⊂ X, f ∈ {0,1}x , so P(Y,f) -> Y=f-1(1) := {x ∈ X : f(x) = 1}, which allows us to construct the initial case by axiom 1.8 because P(Y,f) is true for x∈X. While we have not used property functions in some time, I would like to fully understand the concept. Getting by with a minimal understanding is something I have never been able to do. I have always strived and fought to obtain mastery and complete understanding of any subject I am in. I would appreciate if we could go over this topic in class or in office hours to help me achieve this level of understanding.

I also struggled with Boolean Algebras, but after attending several office hours, conferring with my classmates, and spending even more time in Brody straining myself to understand them, I believe that I have achieved a firm understanding of the concept. Having specific difficulty with proving all four cases before showing that it was closed under complements. Being able to challenge my classmates ideas and proofs while being able to be challenged myself. The exchange of mathematical information and knowledge that my classmates share is amazing to watch.

A concept that has piqued my interest is cardinality. While I am still struggling to fully understand it, this appears to be the start of defining what functions are; a core concept in calculus. Showing injectivity by assigning them to functions to show core definitions such as if f: X -> Y is injective, ∀a,b ∈ X -> f(a)=f(b) ⇒ a=b.This has made me rethink what we actually know, and what we assume when we do calculus. Did the creators of calculus start by proving what functions or cardinality was? What assumptions did they make without proving those assumptions? If they made assumptions, how is it possible that they were right and our ability to base mathematics on those assumptions is correct?

Some additional topics that I want to be covered is points of inflection. I have always thought of the topic to be slightly confusing for me, even though I know I understand it thoroughly. I am excited to learn the proofs behind them as we dive into the essence of calculus, differentiation and integration.

Working through AB and BC calculus problems felt like a puzzle to me. Using the chain rule, quotient rule, or integrating by parts, the fitting and placing of the correctly differentiated or integrating functions into their designated (by formulas) spots was simply fun for me to do. So as we head into the calculus portion of the course, I would love to dive deep into what makes these formulas the way they are. How and why they work. What was the process of developing these formulas, basically the proofs behind them.

Some of my classmates who I have liked working with are Liza and Kaui. Their problem solving and collaboration skills are commendable and ones I hope to achieve someday. Consistently checking with me, asking questions, and answering mine has made this class very pleasurable to attend. Looking over at Liza when we are both confused by a new topic, and then fist bumping when we finally understand it is one of the more rewarding experiences of my classes. I am excited to continue to spend the semester working with them through the complex material and having fun, while challenging, classes. The grit that all of my classmates show is awe inspiring and gives me more drive and motivation to work through the challenging material. I hope they view me in the same light as highly as I praise them.