Department of Mathematics and Computer Science
Emory University
Atlanta, Georgia 30307   January 29, 2019

Dear Professor Ono,

My name is Kenneth DeMason, and I am a third-year undergraduate at UF majoring in mathematics. I am applying to the REU at Emory and am very interested in attending. By attending this program, I would both gain valuable knowledge from a top institution, which would aid me in graduate school, and build relationships with other like-minded individuals.

I first became interested in mathematics in high school. As a student in the IB program, I wrote a mathematics paper on a way to approximate the inverse of $y=x^x$. It turned out that this was just Newton's method in disguise, but the process of finding what I thought to be my own method was fascinating. I continue to enjoy studying a variety of small problems and independent learning. This past August, I began my first mathematics research project, on Minimal surfaces. I investigated the catenoid, the only minimal surface of revolution. As part of this, I worked out a simple proof of this property, and another unique property of the catenoid concerning a relation between its surface area and volume (which neither my advisor nor I have seen discussed before). Afterwards, I extended a formula given by do Carmo (on the initial rate of change of surface area when a surface undergoes a normal variation) to general smooth vector fields. I enjoyed these topics because they were both questions I proposed myself and was later able to solve, and they provided an important foundation for working with surfaces. I have since transitioned to investigating Delaunay surfaces under the Ricci Flow and am currently familiarizing myself with the properties of Delaunay surfaces. I changed topics so that I can eventually make my way to the more abstract areas of differential geometry. These projects motivated me to complete the graduate analysis sequence, take a course in Curves and Surfaces, and study from do Carmo and Montiel & Ros on my own.

Though I work in differential geometry, I also take great interest in algebra. In high school, my pre-calculus teacher talked about some of the higher-level math she had learned while in her master's program. Eventually, she mentioned rings, fields, and finally Galois theory. I was immediately intrigued by these, especially by Galois theory, because I had no clue what they were. That someone could prove there was no "quadratic equation" of sorts for polynomials of degree 5 or greater[1], or which regular n-gons were constructible, bewildered me, and it made the theory seem so powerful. I was excited to finally learn about these concepts in my abstract algebra course at UF and enjoyed studying them so much that I continued to read from Gallian where the course left off. I even considered skipping the first year of graduate abstract algebra so I could jump straight into Galois theory and field extensions. I am eager to learn more about Galois theory and its applications in Geometry.

I believe I have the required background knowledge and motivation to conduct research. I hope you will afford me the opportunity to do so. Thank you for your time and consideration.

Regards,

Kenneth DeMason

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[1] I am aware that Abel proved this prior to Galois.