

Throughout this semester in Calculus I, I have gained a deeper understanding of foundational mathematical concepts that are crucial not only for academic purposes but also for real-world applications, especially in the field of computer science. Initially, I viewed calculus as an abstract and somewhat intimidating subject. This is my third time taking Calculus I, and this time I approached it from the perspective of learning for a specific purpose: the Fast Fourier Transform.

One of the most important skills I have developed in this course is my ability to understand and compute integrals. I now have a solid grasp of how to evaluate definite and indefinite integrals, apply U-Substitution, and interpret the meaning of an integral in different contexts. This has been a significant achievement because integration is a powerful tool used in numerous practical problems, especially in the realm of computer science.

In particular, the concept of the Fast Fourier Transform (FFT), which is integral to signal processing, is directly related to integration. The FFT is an efficient algorithm for computing the Discrete Fourier Transform (DFT), which involves decomposing frequencies into components and finding the sum. This process can be viewed as an application of integration in the frequency domain. By understanding the fundamental mathematical principles behind FFT, I can appreciate how integration is used to analyze signals, whether it's for audio, video, or electromagnetic waves.

This ability to work with integrals and understand their real-world implications was also evident in the signature assignment of this course, where I was required to apply the techniques of integration to solve problems related to area, volume, velocity, and rate. These exercises helped me to not only learn the mechanics of integration but also understand how it can be applied to real-life scenarios. For example, calculating the area under curves or finding the volume of

irregular objects is directly related to real-world engineering and physics problems, such as calculating the mass or center of mass of an object, or determining the total accumulated signal over time. These have further application to computer science through the development of 3D modeling software.

Moreover, the skills learned in this course have honed my problem-solving abilities. I have become more comfortable with abstract thinking, approaching complex problems systematically, and using mathematical tools to break them down into manageable parts. These skills are indispensable in my computer science career, where algorithms, optimizations, and efficient problem-solving are central to the work I will do in software development, data science, and machine learning.