The end of the semester comes with enough challenges of studying, time management, and really hard tests. This class was my first experience with any kind of real coding beyond what I did in middle school for STEM classes that were mostly just games to get a feeling for the idea of what computer science actually is. Throughout this whole semester, I learned that coding is a lot more than those games that I played back in the day. I feel proud to say that whenever I was working on my labs and homework assignments for this class and my roommates would look over my shoulder and tell me how they had no idea what they were looking at, but sometimes I was probably just as confused as they were. I am very grateful for how helpful the teaching and learning assistants were for me and I wish I would have started to use the after hours sooner. Without them I do not think I could have finished this lab at all. Throughout this last week I was able to get the code functioning well and I will discuss the process of how I got there, the major obstacles I had to overcome, and throughout the whole process I was able to think of ways that Graphical User Interfaces (GUI’s) can be used in the future.

To start off, the main goal of the project was to create a GUI that was able to plot a given set of coordinates. It was not as simple as that because the GUI needed to be able to modify the X and Y limits on the graph, label the X and Y axis’s, title the plot, and be able to change the points between three different colors and also be able to change between three different point types. I also needed to create error messages for all of the possible inputs that would cause the GUI to crash. I first organized all of these important features on paper to be able to cross off each of them as I completed them. I started with creating each of the text edit boxes in order to get a rough layout of the GUI. From there I had to label what each box does with text next to each of the boxes. I also had incorporated an empty plot that would be brought up with running the function. The next goal I focused on was creating the two radio button groups to change the color and style of the points. This proved to be one of the most difficult parts of this project for me, but I will elaborate on that after this. From there, I got started on the plotting function. The content of the plotting function is what makes the code function exactly as expected. With this, I had to use many different ‘if…’ statements in a few different ways. One way I used them were to determine if the X string was longer than the Y string (or vice versa) meaning that one of the Y inputs was missing. I also incorporated error messages in these statements that will pop up explaining to the user where the issue was and why it would not work. Another way I used these statements was to create the nine different ways the plot would appear based on color and style selected. Beyond this I used the different GUI variables to be able to label the different parts of the graph, including the title and the X and Y axes. Call backs were used for the plot button and the two different button groups. This short description of the whole process does not do justice to how much work it took to get it done, but I cannot put words to the paper how excited I was when I actually got it to function exactly how I wanted it to.

As mentioned before, there were many problems that came about in the making of this GUI. The first problem I ran into was trying to get a simple plot running with data that would not yield an error. I was running into the issue that I had been trying to plot a string instead of actual numbers. As soon as I was able to convert the X and Y strings into numbers, it worked right away. The next problem came about when I was trying to use the radio buttons but each of them were working independently from each other and could select all three from each of the two sections. In order to correct this, I had to reference some of the example GUIs on canvas and was able to use button groups so that they would switch the selected radio button instead of all staying on. I had to have a unique function for each of the button groups in order for this to function properly. After this was the most challenging part for me, getting the actual inputs from these buttons to be able to modify the properties of what was being plotted. To do this I used an “if…” statements to first find which color was selected. Then inside of each of these cases, I used another “if…” statement to further find which style of point was selected with the already specified color. There were three different cases for each color making for a total of nine different possibilities of how the data would be plotted. I found that the error statements and the GUI controls to be easier and had little problems getting those to work.

In the end, I was able to get a good feeling of how the GUI’s worked and how I might be able to use them in the future. In my future I could see myself using a GUI for one dimensional motion physics problems. These use the same few variables in their equations but none of them use all of the variables to find a result. I would like to see a GUI that you could input into a specified edit box the variables you are provided and a button a button group of what you are trying to find and provide an output with the correct units. You could even incorporate a way to change what units you input into the edit boxes for each of the variables.

In conclusion, this project has taught me about the graphical user interfaces to a point that I am comfortable with trying to make more one my own someday. I first discussed the process of creating the code, then further discussed the problems I came across in the writing of the code, and in the end, I am excited to see if I will be able to make a physics GUI on my own. I really enjoyed this semester in getting a good introduction to the computer science field and cannot wait to be able to apply this in my future endeavors.