Mile stone report 3:

This week the methods that were being used checking for the probability of the wave function being inside and outside of the barrier. The code used for this was extracting the probability density of the wave function inside the barrier and then checking if it was nonzero. This was to see if quantum tunneling does occur and to see what the probability of it happening was. The next method was plotting the probability distribution at different steps of time to see how the wave evolved with time. A for loop was used for going each step of time and was also used for plotting each step as well. I plotted 99 steps. Those were the two new methods added to the code this week. The for loop for the time is a direct change to what I had last week so that I could plot each step individually. The portion for finding the probability of the wave function being in the barrier is new code added. I also did the same techniques on a different wave this week as well, the new wave function is a sine wave whereas the previous one is gaussian. Did this just to have comparison of results, all other parameters were kept the same. Another simulation added was that of a two barriers but this is not fully complete yet. The wave function looks as it is just doing through the barriers with no resistance so I will need to revisit the code this portion to see what is causing this. Over progress, I got some data from this week that I can actually anaylze. The probabilities I got for the gaussian wave being inside the barrier was 14.09% and outside barrier was 85.91%. For the sine was 4.15% inside the barrier and 95.85% outside the barrier. Which I had found odd at first because I had interpreted the 85.91% and 95.85% as the probability of the wave passing through the barrier but I now realize that is the probability of the wave being outside of the barrier on both sides of it, Making more sense since I had thought that those probabilities were too high for the wave to pass through the barrier. At least the percent of being inside does confirm further that quantum tunneling does occur. The plots of the probability distributions over time does give me better understanding of how the wave is behaving as time goes and it is pretty interesting to see how different each wave is to the other. The sine wave is already on the other side of the barrier visually but once it starts to the move you can see that only a small portion can pass through the barrier. Which is different than the gaussian wave because with the one it begins on the left of the barrier before moving towards it. Also interesting to not that the sine wave also had a lower probability to be inside the barrier than the gaussian wave. The next step for this project is fix the code regarding the two potential barriers so that I can do the same analysis on this simulation that I did with the previous two wave types. As well to find the correct way for finding the probability of the wave passing through and not getting the probability of the wave being outside the barrier. Then comparing all three results and seeing what varies and what does not. \

Sources used:

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https://www.youtube.com/watch?app=desktop&v=j8cjzZG1qa8