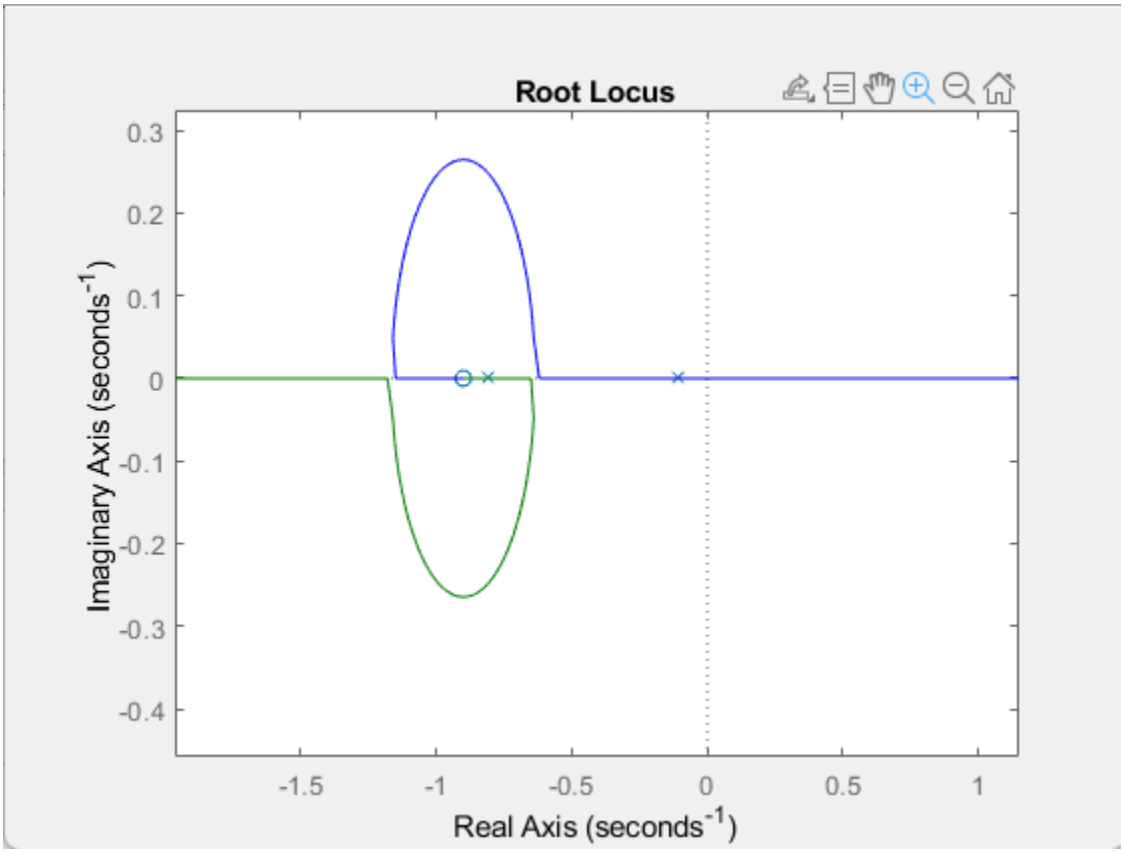
Project Installment 3

Anirudh Devarakonda

In this project, we modeled the number of diabetics and we have analyzed the model's stability using the root locus plot, using a bode plot to explain its stability, and a Nyquist plot.

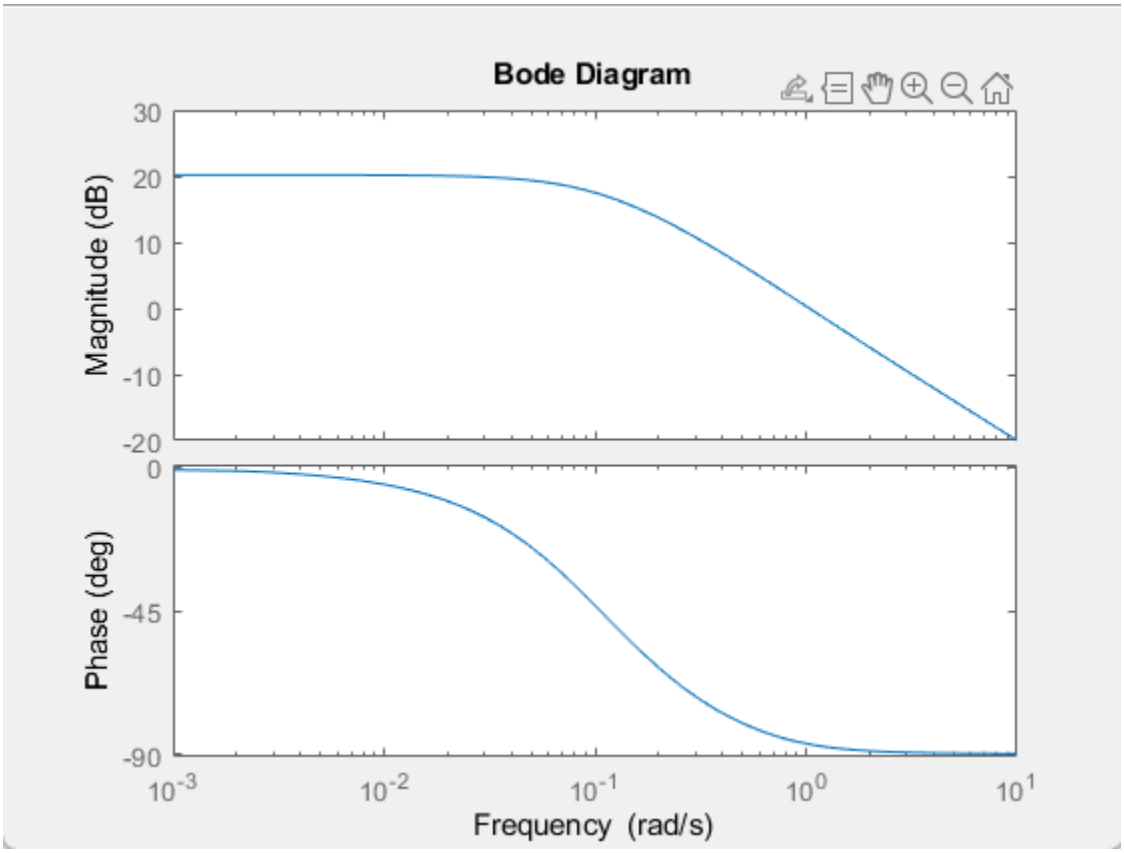
Part 1: Root Locus Plot and interpretations

The root locus analysis of a system is a graphical method for seeing how the roots of a system will change while varying a certain system parameter, gained within a feedback system implemented. The root locus plots the poles of the closed-loop transfer function in the complex plane as a function of a K, the gain parameter.



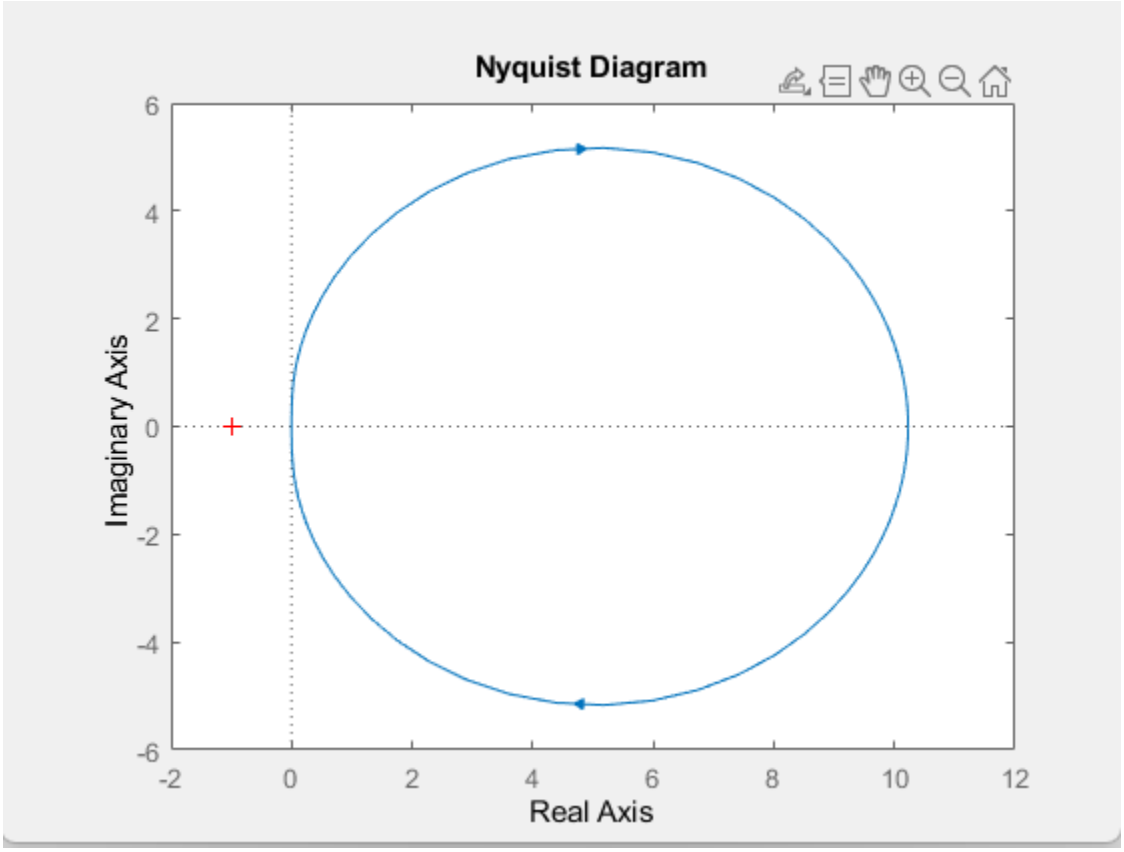
As you can see from the root locus plot above, the poles are in the CHLP, which means that it is stable. Since for values of K <0 the system becomes unstable, as the locus graph will be in the RHP.For any values of K> 0 the system will lie in the LHP which makes the system stable. In order for the system to be stable, the gain parameter must be above 0, so we can avoid the RHP.

Part 2: Bode plot analysis



The larger the gain margin, the greater the stability of the system. The gain margin is the amount of gain, which can be increased or decreased without the system becoming unstable . It is usually expressed as a magnitude in dB.From the magnitude plot of the bode plot, our gain margin is 20 db. And phase margin is 45 from the crossover frequency. The steady state error from project two is consistent with the bode plots as we can find it from the openloop bode plot and using the same formula from the time domain analysis

Part 3: Nyquist Plot analysis



The gain and the phase margin 20 and 45 from the nyquist plot and it is similar to the bode plot analysis.

Conclusion:

In this project, we delved into modeling the number of diabetics in the world and how it will change given a certain input into the population. As time progresses the number of diabetics will change, and we need to model a stable system and analyze it in order to see the effects of the no. of diabetics on the total population. This can be used for a lot research as scientists can model the rate at which diabetes is affecting people. I learned that stability analysis in population analysis is very prominent than I thought so before. Modeling a stable system that examines the no. of diabetics was interesting. Since this project is not a solid hardware system like a machine or a motor, something more sophisticated is needed in order to control the system. Controlling the system means that we need to control the rate at which people are getting diabetes, so a more sophisticated public health measure needs to be implemented. The gain parameters can be represented as the number of certain medications needed in a sample population to control the number of diabetic patients to keep it at a stable rate and implement medication to prevent other people from getting diabetes. The research that can be done in this field can be very important as diabetes is a harmful disease, and breakthroughs in this field can lead to more people living healthier lifestyles.