Homework 4

CSE Spring 2023

Due: 15 Mar 2023

1. *(8 points)* Find the zeros and poles of the following four transfer functions. Plot the zeros and poles on the complex plane using a method of your choosing (Python's Control Systems Library, MATLAB or pen and paper), denoting zeros with a circle and poles with a cross. Determine whether the system is stable.

$$\frac{(s-7)(s+7)}{(s+10)(s+1)(s+0.01)}$$

$$\frac{1}{s^3 - 6s^2 + 11s - 6}$$

$$\frac{s^2 - 15s + 56.25}{s^3 + 22s^2 + 89s - 112}$$

$$\frac{s^4 + s^3 + s^2 + s + 1}{s^6 + 12s^5 + 85s^4 + 360s^3 + 1084s^2 + 1968s + 2340}$$

2. *(2 points)* Either using research or logic, answer the following questions:

   (a) If in the characteristic **equation** of the transfer function some coefficients are greater than 0 and some less than 0, can we conclude anything about the stability of the system from this fact? Why?

   (b) If in the characteristic **equation** of the transfer function all coefficients are greater than 0, can we conclude anything about the stability of the system from this fact? Why?