

Assignment 4

Refined Root Locus Sketching and Bode plots

Bode Plots

Note: Bode plot paper is available on the wiki, you dont have to print it out, you can “sketch” using any software (that can draw lines).

1. For the following systems, change the equation to the equivalent form, plot the gain, s^n , $(s + a)^{\pm 1}$ and $(s^2 + 2\zeta\omega_n s + \omega_n^2)^{\pm 1}$ terms separately on the same bode plot and graphically add them. Identify the gain and phase margins and comment on whether the closed loops system is stable or not. (show all working)

$$\frac{50}{s^2 + 5s} \quad (1)$$

$$\frac{s + 25}{s^2 + 4s} \quad (2)$$

$$\frac{640}{s^3 + 16s + 64s} \quad (3)$$

2. A client would like the following system to have no error to a step input and a phase margin of at least 50 degrees. Design a compensator to achieve this and draw the uncompensated plant, the compensator and the compensated system.

$$\frac{5400}{s^2 + 60s + 900} \quad (4)$$

3. For the following systems, state the system type and read the approximate steady state error for a step, ramp and parabolic input from the plot. Be sure to show how you read the steady state error from the plot by drawing on the given plots.





