ECE 141, Spring 2022
Homework 7

6.5 *Complex poles and zeros*. Sketch the asymptotes of the Bode plot magnitude and phase for each of the listed open-loop transfer functions, and approximate the transition at the second-order break point, based on the value of the damping ratio. After completing the hand sketches, verify your result using Matlab. Turn in your hand sketches and the Matlab results on the same scales.

(e) $L(s) = \frac{(s^2+4)}{s(s^2+1)}$

6.7 *Mixed real and complex poles*. Sketch the asymptotes of the Bode plot magnitude and phase for each of the listed open-loop transfer functions. Embellish the asymptote plots with a rough estimate of the transitions for each break point. After completing the hand sketches, verify your result with Matlab. Turn in your hand sketches and the Matlab results on the same scales.

(b) $L(s) = \frac{(s+2)}{s^2(s+10)(s^2+6s+25)}$

6.16 Determine the range of K for which the closed-loop systems (see Fig. 6.18) are stable for each of the cases below by making a Bode plot for $K = 1$ and imagining the magnitude plot sliding up or down until instability results. Verify your answers by using a very rough sketch of a root-locus plot.

(b) $KG(s) = \frac{K}{(s+10)(s+1)^2}$

6.17 Determine the range of K for which each of the listed systems is stable by making a Bode plot for $K = 1$ and imagining the magnitude plot sliding up or down until instability results. Verify your answers by using a very rough sketch of a root-locus plot.

(c) $KG(s) = \frac{K}{(s+2)(s^2+9)}$