

## Discussion Problems

Week 7

Problems: 5.8a, 5.8d, 5.12

**5.8** *RHP and zeros.* Sketch the root locus with respect to  $K$  for the equation  $1 + KL(s) = 0$  and the listed choices for  $L(s)$ . Be sure to give the asymptotes and the arrival and departure angles at any complex zero or pole. After completing each hand sketch, verify your results using Matlab. Turn in your hand sketches and the Matlab results on the same scales.

(a)  $L(s) = \frac{s+2}{s+10} \frac{1}{s^2-1}$ ; the model for a case of magnetic levitation with lead compensation.

(d)  $L(s) = \frac{s^2+2s+1}{s(s+20)^2(s^2-2s+2)}$ . What is the largest value that can be obtained for the damping ratio of the stable complex roots on this locus?

**5.12** Sketch the root locus for the characteristic equation of the system for which

$$L(s) = \frac{(s+2)}{s^2(s+5)},$$

and determine the value of the root-locus gain for which the complex conjugate poles have the maximum damping ratio. What is the approximate value of the damping?