

Signals and Systems Problems S17, S18, S19

Reading: O&W 11.1, Lecture 18

S17) Draw the Nyquist plot for the following loop transfer functions and in each case determine if there are positive values of the gain K that will place the closed loop system at the edge of instability

a)
$$G(s)H(s) = \frac{K(s-2)}{(s+1)}$$

b)
$$G(s)H(s) = \frac{K(s-3)}{s^2 + 3s + 2}$$

S18) A feedback control system has a third order system in the forward path with transfer function

$$H(s) = \frac{100K}{(s+1)(s+10)^2}$$

and unity feedback so

$$G(s) = 1$$

Draw the Nyquist diagram for this system for both positive and negative values of the gain K . Be sure to include tables of magnitude and angle for at least the frequencies of zero and infinity.

S19) Using Bode diagrams approximate the positive value of the gain K for which the system is just at the edge of instability. What are the approximate frequencies for the closed loop poles in each case?