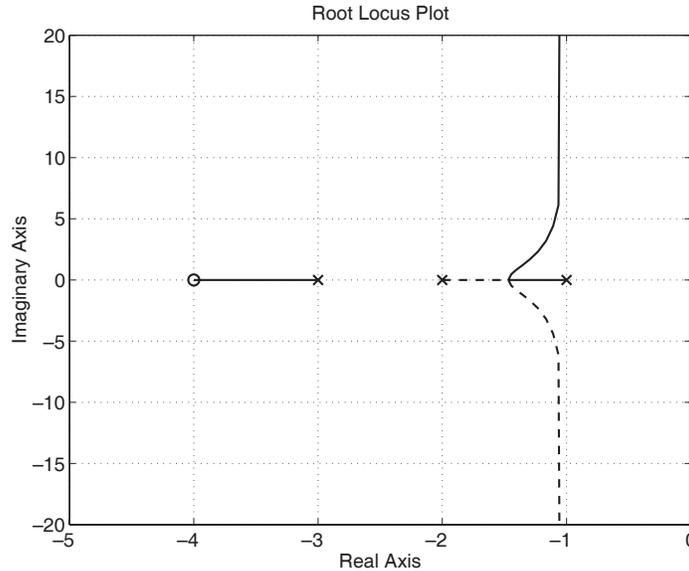# EE 4CL4 – Control System Design

Homework Assignment #5

1. Determine the open-loop transfer function of the system generating the root locus plot shown in Figure 1. **(25 pts)**

Figure 1

2. Determine the PID controller parameters (for the *standard form*) for a plant with the nominal model:

$$G_o(s) = \frac{-s+2}{(s+2)^2},$$

using the Ziegler-Nichols oscillation method. **(25 pts)**

3. Use the pole placement method to synthesize a controller $C(s)$ for the nominal plant model:

$$G_o(s) = \frac{1}{(s+2)^2},$$

that produces the nominal closed-loop characteristic polynomial $A_{cl}(s) = (s^2 + 4s + 9)(s+8)$, using MATLAB to solve the matrix equations. **(25 pts)**

4. Find suitable PID controller parameters (for the *standard form*) for a plant with the nominal model:

$$G_o(s) = \frac{10}{(s+1)(s+10)}, \tag{1}$$

using the reaction curve method with:

a. the Ziegler-Nichols parameters, and

b. the Cohen-Coon parameters. **(25 pts)**