QUIZ # 7

*Ahmad F. Taha*

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**Name**:

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The objective of this exercise is to plot the root locus corresponding to a unity feedback system with a characteristic polynomial given as follows:

$$1 + KG(s)H(s) = 1 + K\frac{(s+2)}{s^2+2s+2}.$$

Answer the following questions. Show your work.

1. Determine the poles and zeros of the open loop transfer function $(G(s)H(s))$. How many branches does the RL have?

2. Determine the asymptote angles $\phi_q$ as well as their point of intersection $\sigma_A$. Recall that:

$$\phi_q = \frac{(1+2q)180}{n_p - n_z}\,\text{deg}, \forall q = 0, 1, 2, \ldots, n_p - n_z - 1$$

$$\sigma_A = \frac{\sum_{i=1}^{n_p} Re(p_i) - \sum_{j=1}^{n_z} Re(z_j)}{n_p - n_z}$$

3. Determine any breakaway/break-in points. If none exist, state none!

4. Determine the angle of departure/arrival, if any. Recall that:

$$\text{AoD from a complex pole}: \ \phi_p = 180 - \sum_i \angle p_i + \sum_j \angle z_j,$$

$$\text{AoA at a complex zero}: \ \phi_z = 180 + \sum_i \angle p_i - \sum_j \angle z_j$$

5. Sketch the root locus—no need to find the crossings with the $j\omega$ axis.