Problem 1

Given the following plots of the open loop poles and zeros in \( G(s)H(s) \) sketch the root locus for \( 0 < k < \infty \).
The sketch should include:
- Where does the root locus exist on the real axis
- How many asymptotes, and where are they.
- Then sketch the plot

Stable for all \( k > 0 \)？ Yes
If no, is it unstable for high or low gains

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\[ \sigma = \frac{\text{finite \_ poles} - \text{finite \_ zeros}}{\text{\# finite \_ poles} - \text{\# finite \_ zeros}} \]
\[ \phi_d = \frac{(2k + 1)180}{\text{\# finite \_ poles} - \text{\# finite \_ zeros}} \quad k=0, 1, 2 \ldots \]

Another problem on the back.
Problem 2

Find the transfer function between $R(s)$ and $C(s)$ using any method you would like. Simplify to one numerator and one denominator.

Block Diagram Reduction Solution
- Move $G_1(s)$ before 2 junction

2 Ways to Proceed
- $G_1(s) H_2(s)$ in Parallel with $H_1(s)$
- $H_1(s) + G_1(s) H_2(s)$

2 Use Feedback Reduction

$\frac{G_2(s)}{1+G_2 H_1}$