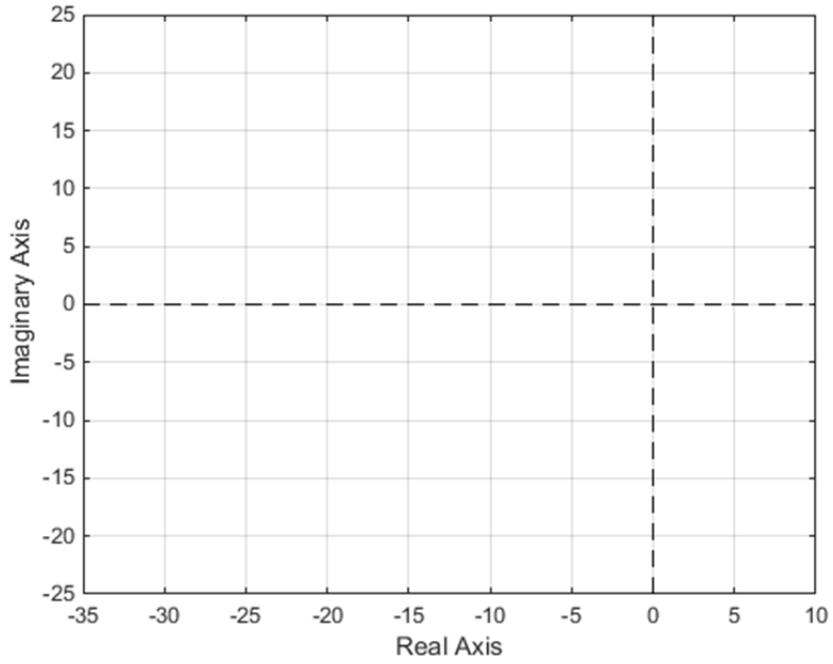
Root Locus Rules & Practice

Step 1: Create pole-zero map by finding and plotting the poles and zeros of L(s) (the loop gain)



Step 2: Determine the number of loci

The number of closed loop poles is the same as the number of open loop poles - The number of root loci is equal to the number of open loop poles.

Step 3: Determine where the loci begin and end

The closed loop root loci *start* at the open loop poles

The closed loop root loci *end* at the open loop zeros. If the number of zeros is less than the number of poles, some closed loop poles go to infinity.

Step 4: Sketch the loci that lie on the real axis

When s^* is real, $\angle L(s^*) = -180°$ (and thus s^* is on the root locus) whenever there is an *odd* number of real poles and zeros of $L(s)$ to the right of s^*.

Step 5: Sketch the asymptotic loci by finding the asymptote centers and asymptote angles

- Center of asymptote

$$\sigma_A = \frac{\sum \text{poles of } L(s) - \sum \text{zeros of } L(s)}{n - m}$$

- Angles of asymptotes

$$\phi_A = \frac{2q+1}{n-m}180° \quad q = 0, 1, \cdots, n-m-1$$