

Pb 31 Sketch the root locus for

$$G(s)H(s) = \frac{K(s+2)(s+1)}{(s+0.1)(s-1)}$$

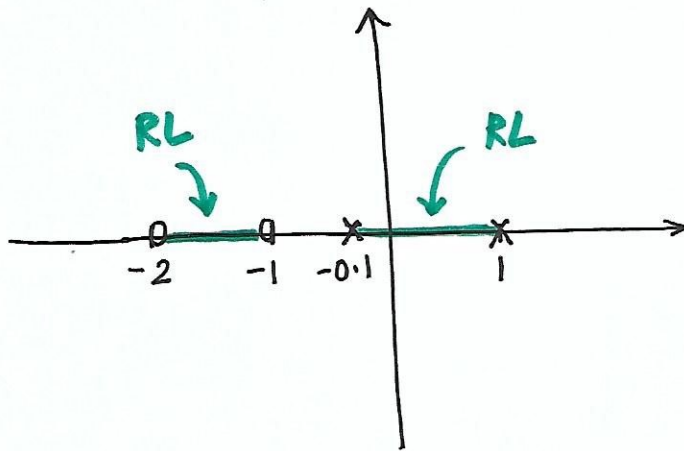
Solution

- ① $K=0$ points are at $s = -0.1, s = 1$
- ② $K=\infty$ points are at $s = -2, s = -1$
- ③ Number of branches = 2
- ④ The root locus is symmetrical about the real axis
- ⑤ Asymptotes of the root loci

There are no asymptotes.

⑥ Centroid - None

⑦ Root loci on the real axis



⑧ Angles of departure and arrival - None

⑨ Intersection of the root loci with the imaginary axis

$$1 + G(s)H(s) = 0, \quad 1 + \frac{K(s+2)(s+1)}{(s+0.1)(s-1)} = 0$$

$$s^2(1+K) + s(3K-0.9) + (2K-0.1) = 0$$

$$s^2 \quad (1+K) \quad (2K-0.1)$$

$$s^1 \quad (3K-0.9)$$

$$s^0 \quad 2K-0.1$$

$$3K-0.9 = 0$$

$$K = 0.3$$

$$s^2(1+0.3) + (2 \times 0.3 - 0.1) = 0$$

$$s = \pm j0.6$$

⑩ Breakaway points

$$\frac{d}{ds} \left[\frac{(s+2)(s+1)}{(s+0.1)(s-1)} \right] = 0, \quad -3.9s^2 - 4.2s + 1.5 = 0$$

$$s = -1.35, \quad s = 0.3$$

