

Fall 2021 (110-1)

控制系統  
Control Systems

Unit 50  
Root Locus (s-Domain)

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NTU-EE

Sep 2021 – Jan 2022

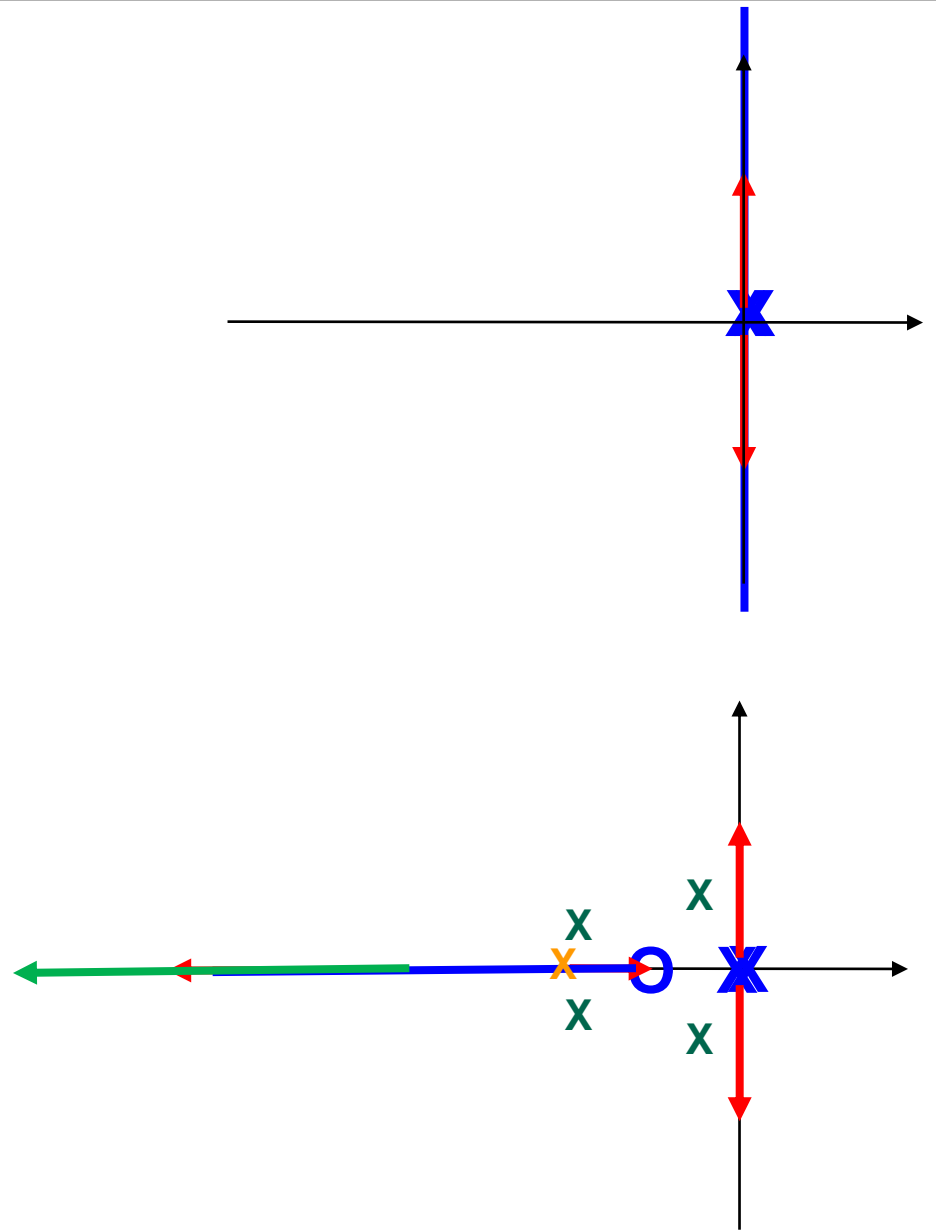
# Unit 5

# Root Locus

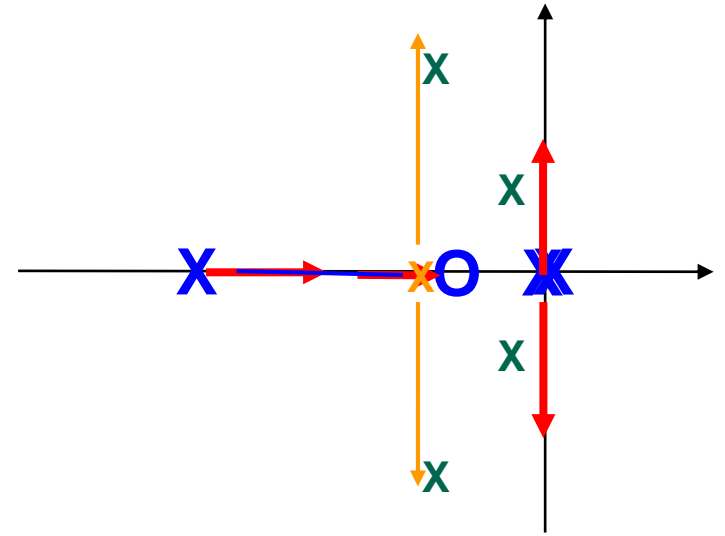
- **By Hand:**
  - Hand Writing in Exam (40%)
  - Use the **5 rules** of Root Locus Method
    - to **roughly sketch** the root locus of any transfer function
    - by **identifying** these **critical** root locations
  - **Properly choose** some roots
    - between these **critical** root locations
- **By Computer:**
  - Multiple Choice in Exam (60%)
  - Use Matlab codes
    - to draw the **exact root locus** of any transfer function
  - **Design proper** transfer function and
    - select associated and reasonable** gain value

$$\Rightarrow 1 + K_P \frac{1}{s^2} = 0$$

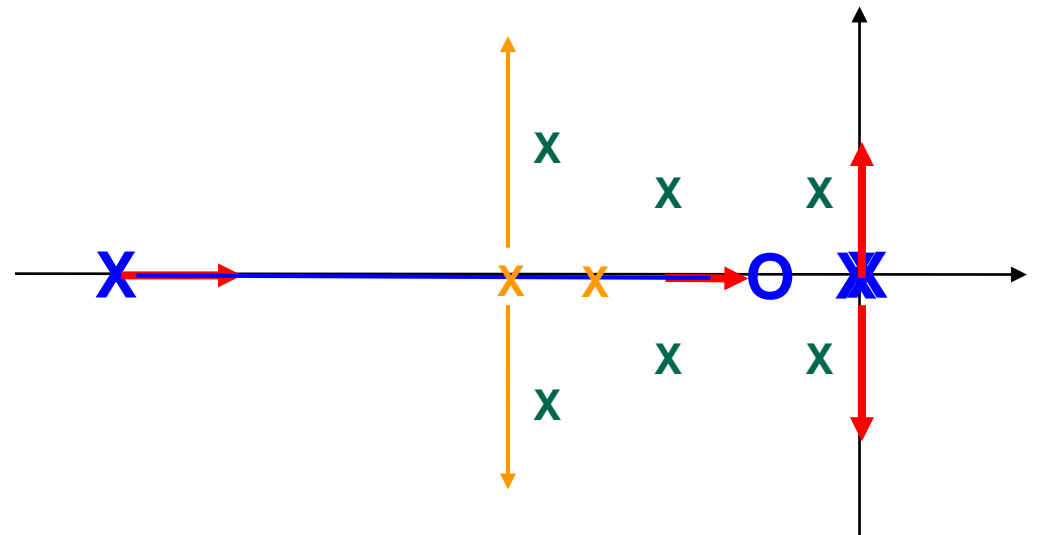
$$\Rightarrow 1 + K \frac{s+1}{s^2} = 0$$



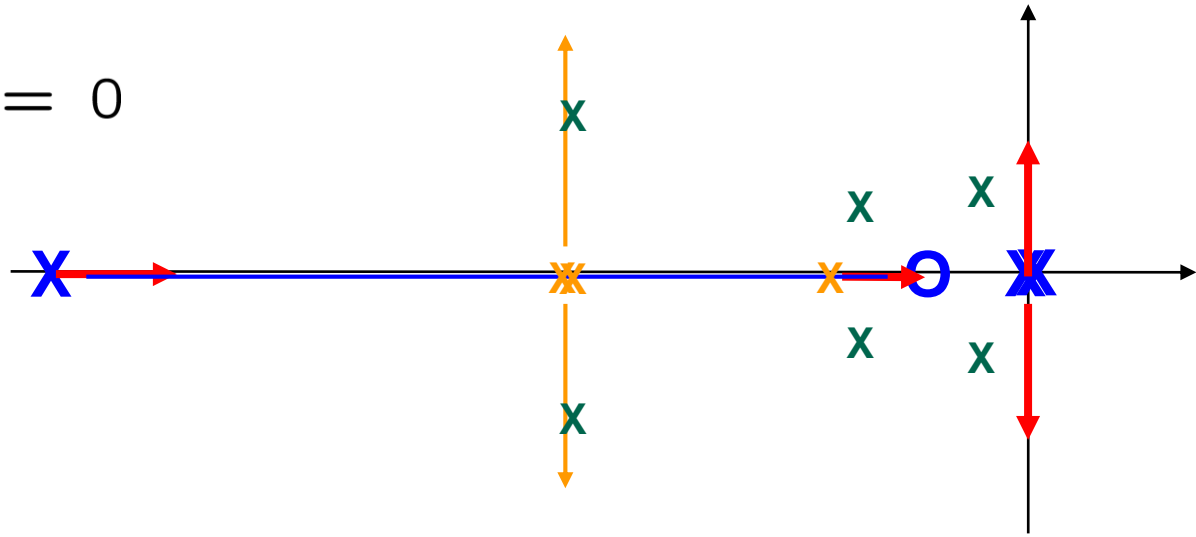
$$\Rightarrow 1 + K \frac{(s + 1)}{s^2 (s + 4)} = 0$$



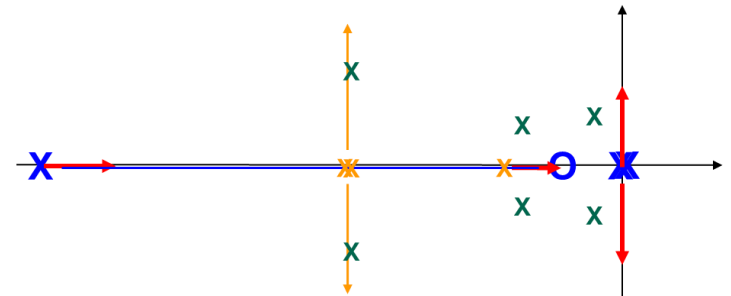
$$\Rightarrow 1 + K \frac{(s + 1)}{s^2 (s + 9)} = 0$$



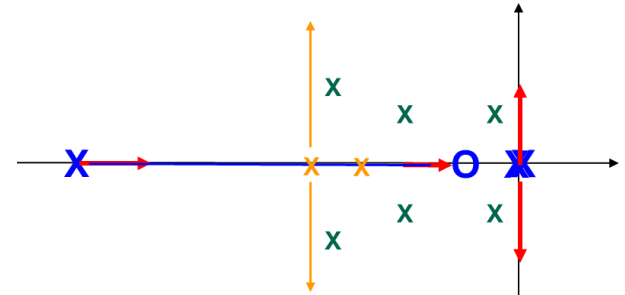
$$\Rightarrow 1 + K \frac{(s + 1)}{s^2 (s + 12)} = 0$$



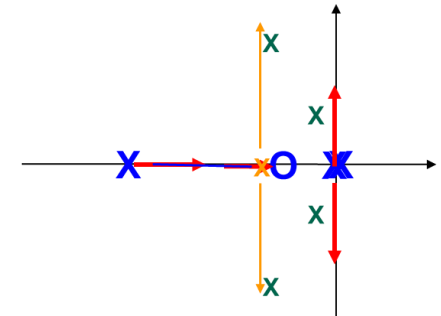
$$\Rightarrow 1 + K \frac{(s + 1)}{s^2 (s + 12)} = 0$$



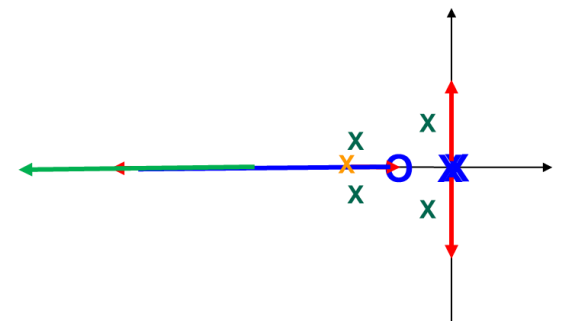
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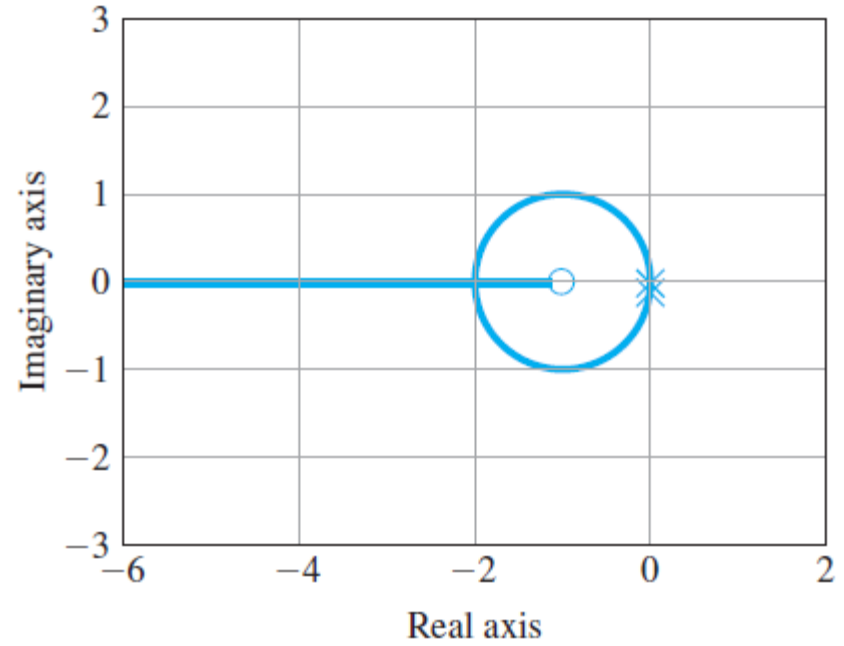
$$\Rightarrow 1 + K \frac{(s + 1)}{s^2 (s + 4)} = 0$$



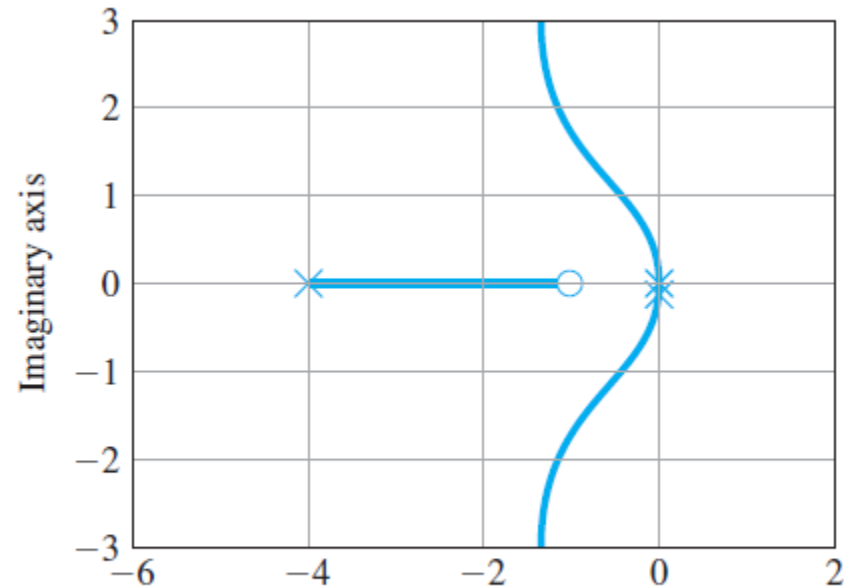
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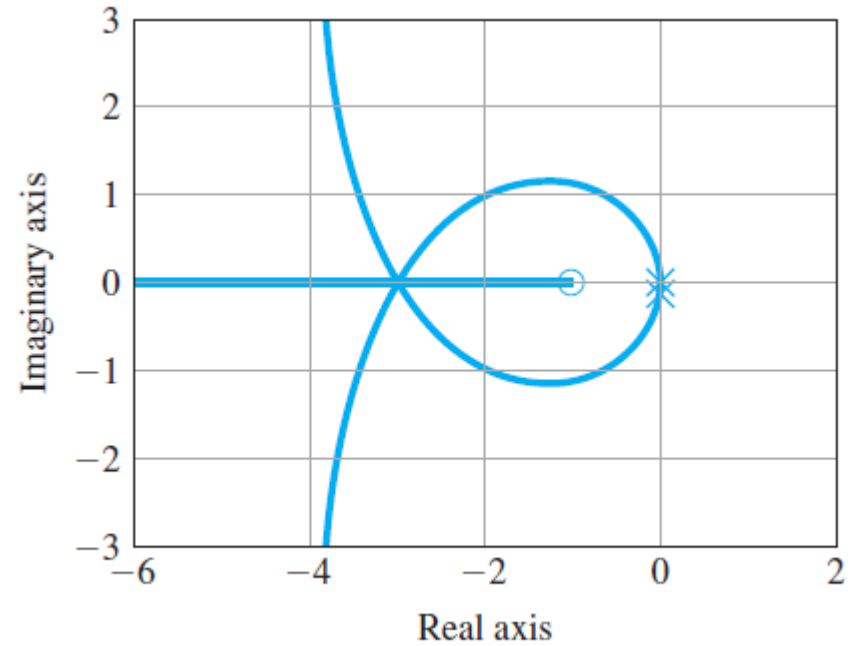


$$\Rightarrow 1 + K \frac{(s+1)}{s^2 (s+4)} = 0$$

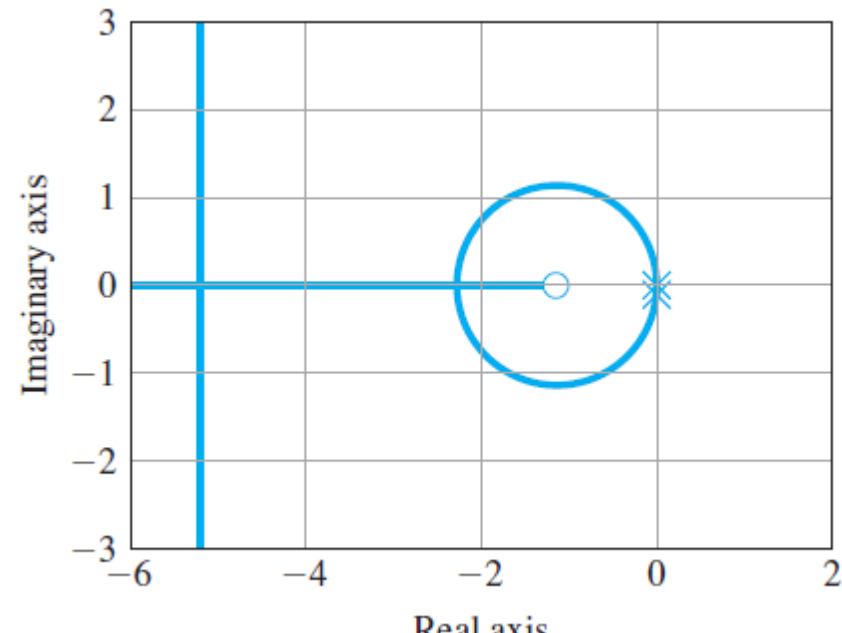


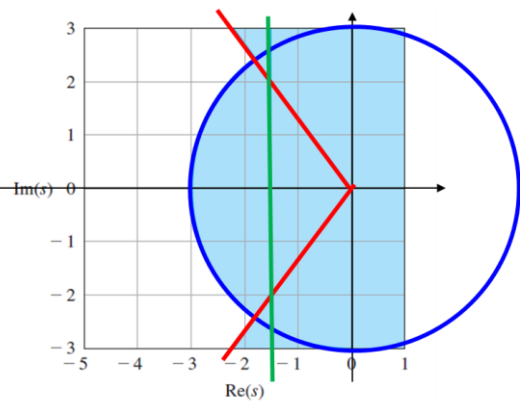
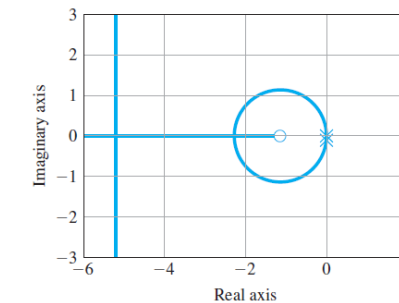
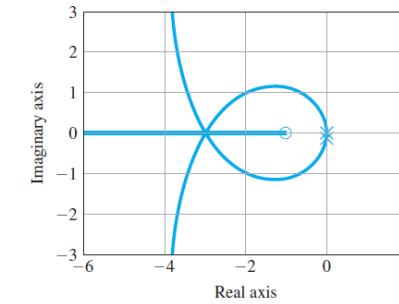
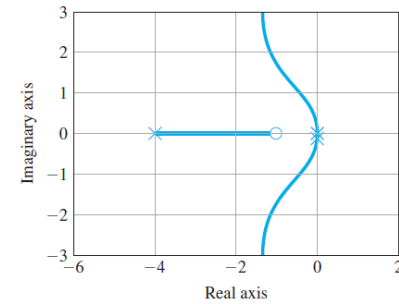
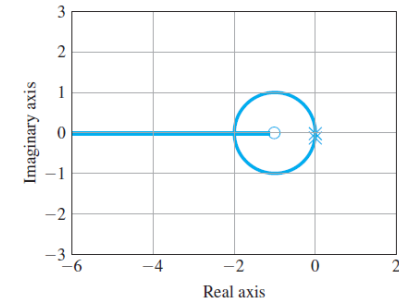
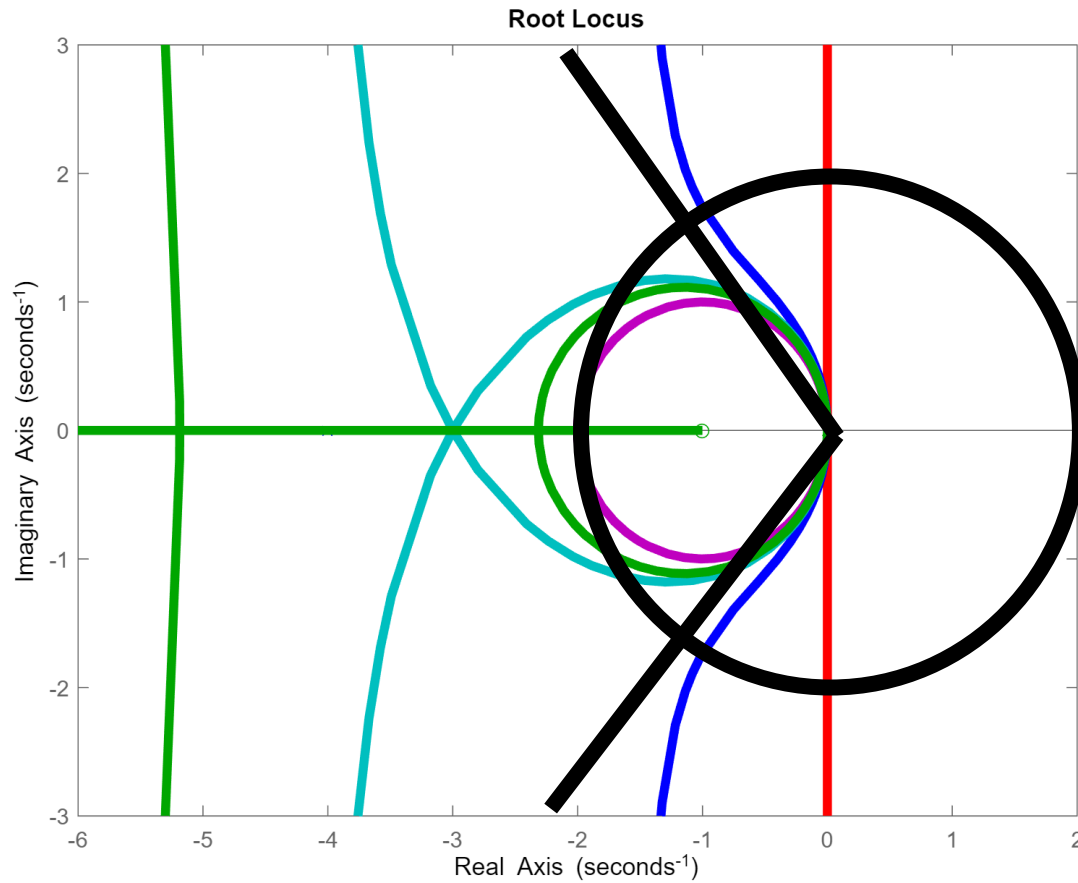


$$\Rightarrow 1 + K \frac{(s + 1)}{s^2 (s + 9)} = 0$$



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- Proper transfer function
- Reasonable gain values