

PROCESS DYNAMICS AND CONTROL

Ali M. Sahlodin
Department of Chemical Engineering
Amirkabir University of Technology
Fall 1397 S.H



ROOT LOCUS METHOD

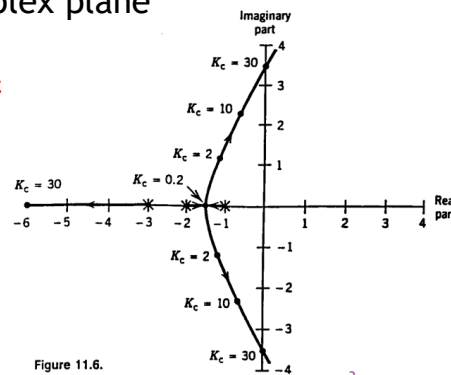
- ◉ Root locus: useful tool for
 - Analyzing **relative** stability
 - Controller tuning
- ◉ Example

$$G_{OL}(s) = \frac{4K_c}{(s+1)(s+2)(s+3)} \quad (11-108)$$

ROOT LOCUS DIAGRAM

- Plot **poles** of characteristic polynomial as gain K_c is increased
- See for what K_c poles start to enter right-hand side of complex plane

The plot is symmetric about the Real axis (why?)



EXAMPLE

$$G_p = \frac{1}{(s+1)(s+4)(s+3)}$$

$$G_{cl} = \frac{K}{(s+1)(s+4)(s+3)} \cdot \frac{1}{1 + \frac{K}{(s+1)(s+4)(s+3)}}$$

$$(s+1)(s+4)(s+3) + K = 0$$

Apply **locus** in MATLAB or Octave

```
G1=tf(1,[1 1])
G2=tf(10,[1 4])
G3=tf(1,[1 3])
G=G1*G2*G3
rlocus(G,1,0,100);
```

