

Spring 2021

控制系統
Control Systems

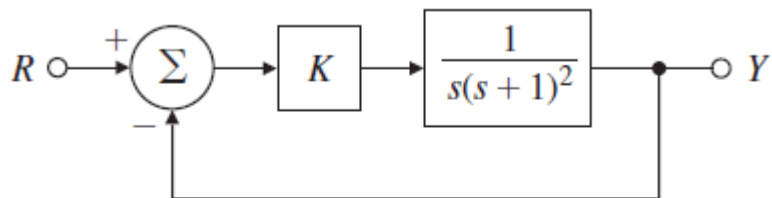
Unit 6D
Neutral Stability

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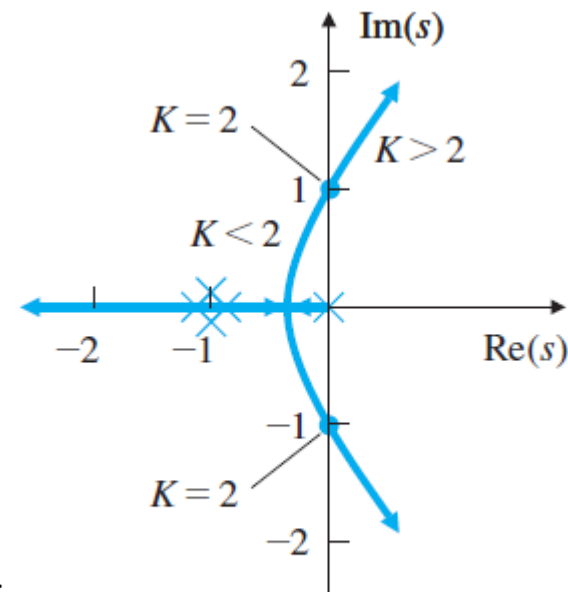
- In early days of electric communications, most instruments were judged in terms of their frequency response.
- That is, when feedback amplifier was introduced, techniques to determine stability in presence of feedback were based on this response.
- Suppose the CL TF is known, we can determine stability by inspecting the denominator.
- However, the CL TF is usually unknown.
- Another way, to determine CL stability only by evaluating frequency response of OL TF,



$$\Rightarrow 1 + K L(s) = 0$$

(a)

$$\Rightarrow L(s) = -\frac{1}{K}$$



(b)

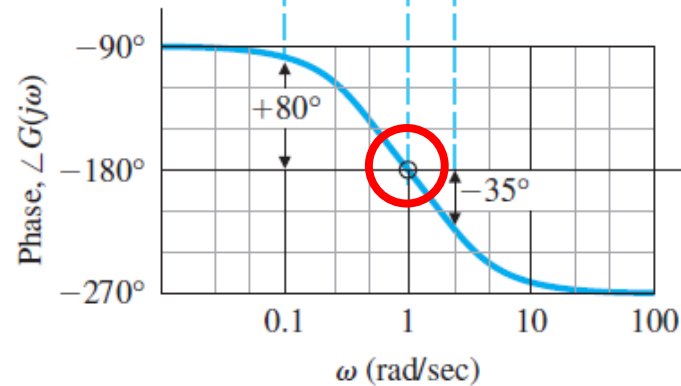
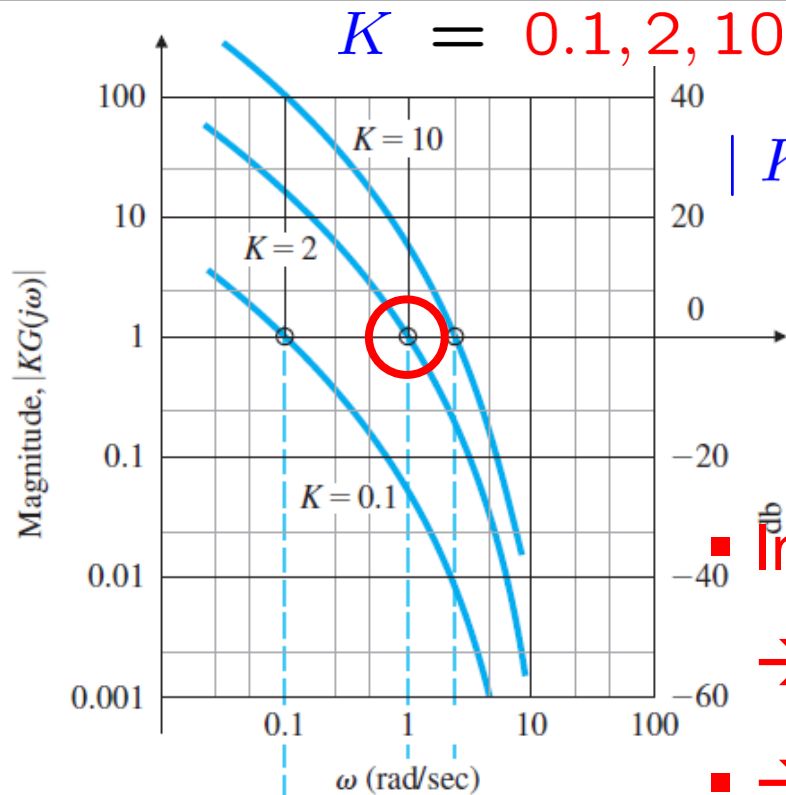
- **Neutrally stable points:** roots lie on the **IM axis**, $s = j(1)$ or $j(-1)$
- In Section 5.1, all points on the locus have the property that

$$|K G(s)| = 1$$

$$\angle G(s) = 180^\circ$$

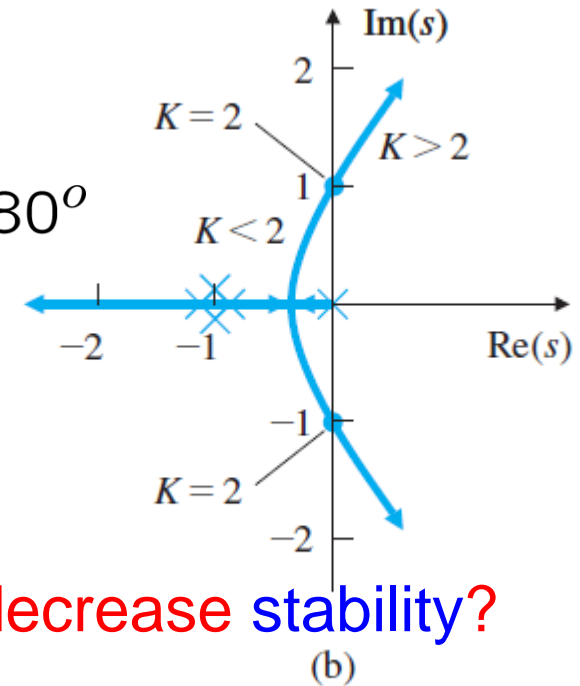
$$|K G(j\omega)| = 1$$

$$\angle G(j\omega) = 180^\circ$$



$$|KG(j\omega)| = 1$$

$$\angle G(j\omega) = 180^\circ$$



Increasing gain

→ increase OR decrease stability?

→ $|KG(j\omega)| < 1$!!!

However, for some systems,

→ $|KG(j\omega)| > 1$!!!

Need to check their root locus

OR, by Nyquist Stability Criterion