

# Studio di stabilità e valore di un parametro

$$P(s) = s^3 + 3s^2 + 3s + (1 + k) \quad k \in \mathbb{R}$$

$$\begin{array}{c|cc} 3 & 1 & 3 \\ 2 & 3 & (1+k) \\ 1 & (8-k) & \leftarrow \text{non lo diviso per } +3 \\ 0 & (1+k) & \end{array}$$

per avere stabilità asintotica

$$\begin{cases} f - k > 0 \\ 1 + k > 0 \end{cases} \Rightarrow \begin{cases} k < f \\ k > -1 \end{cases}$$

$$-1 < k < f$$

stab. as.

$$k = -1?$$

2 poli.  
a parte  
+ 1 zero  
per  $s=0$

$$\begin{array}{c|cc} 3 & 1 & 3 \\ 2 & 3 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{array}$$

stab. semplice

$p(s)$  ha  
radice per  $s=0$

$$k = 8 ?$$

$$\begin{array}{c|cc} 3 & 1 & 3 \\ 2 & 3 & 9 \\ 1 & 0 & \\ 0 & & \end{array}$$

↪ tuta ma  
nija nullo!  
"indice dvojici"

$$3s^2 + 9 = 0 \Rightarrow s_2 = \pm j\sqrt{3}$$

Stab. semplice

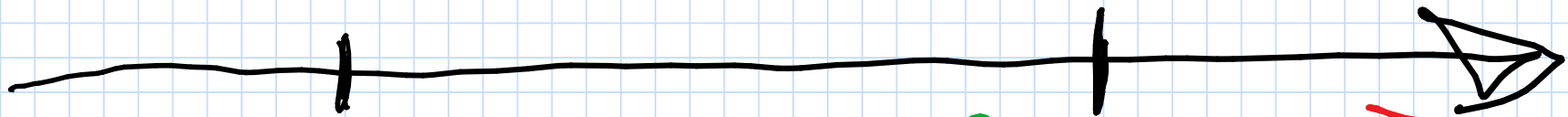
obs.  
scupl.

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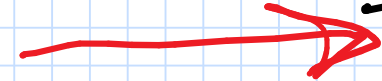
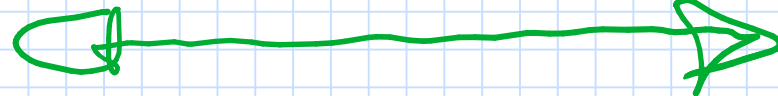
obs.  
scupl.

∅

∅



inst.



es.  
obs.

inst.

$$s^4 + 6s^3 + 11s^2 + 6s + (k+2) = 0$$

$$\begin{array}{l|l} 4 & 1 & 11 & k+2 \\ 3 & 6 & 6 & \\ 2 & 10 & k+2 & \\ 1 & 18-6k & & \\ 0 & k+2 & & \end{array}$$

← man dividieren + 10

$-2 < k < 8$  stab. es.

$k = 2$   $k = 8$  stab. ausgegl.  
 $k < -2$   $k > 8$  insto

$$p(s) = 0$$

$\bar{s}$  radice doppia

$$p(\bar{s}) = 0$$

$$\left. \frac{d}{ds} p(s) \right|_{s=\bar{s}} = 0$$

$$k=8$$

$$\begin{array}{c|cccc} 4 & 1 & 11 & 10 & \\ 3 & 6 & 6 & & \\ 2 & 10 & 10 & & \\ 1 & 0 & & & \\ 0 & & & & \end{array}$$

$$10s^2 + 10 = 0$$

$$s = \pm j$$

I  $\delta$  :  $s=0$  radice doppia?

da 0 annullare "nife I"  $\rightarrow$   $k=8$

nife 2 dovrebbe essere

10 0  $\leftarrow$   $k=-2$

non  
c'è!

$\Rightarrow$   $\mathbb{R}$  :  $p(-5)=0$  ?