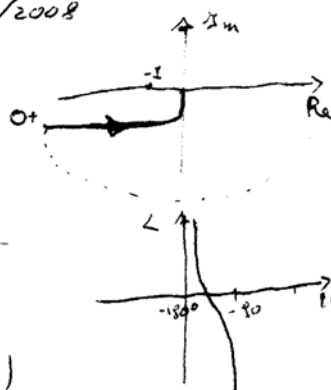
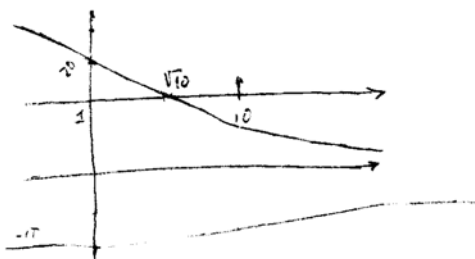


1) $F(s) = \frac{10}{s^2} \left(1 + \frac{s}{10}\right)$

NON ASINTOTICAMENTE STABILE
NON È UN FILTRO

ASINTOTICAMENTE STABILE A CIELO CHIUSO ($m_p \approx 20^\circ$, $m_a = +\infty$)



2) $G(s) = \frac{10s^2 + 50s}{s^2 + 11s + 10}$

a)
$$\begin{cases} \dot{x} = \begin{pmatrix} 0 & 1 \\ -10 & -11 \end{pmatrix} x + \begin{pmatrix} 0 \\ 1 \end{pmatrix} u \\ y = (-100 \quad -60)x + 10u \end{cases}$$

b) $|G(j5)| = 6.2$
 $\angle G(j5) = +0.52$

$y(t) = 18.6 \cos(5t + 0.62)$

c) L'ingresso è $u(t) = t \cdot 1(t) - (t-1) \cdot 1(t-1) - 1(t-5)$

Risposta al gradino $Y(s) = \frac{10s^2 + 50s}{s^2 + 11s + 10} \cdot \frac{1}{s} = \frac{0}{s} + \frac{40/9}{s+1} + \frac{50/9}{s+10}$

$y(t) = \left[\frac{40}{9} e^{-t} + \frac{50}{9} e^{-10t} \right] 1(t)$

Risposta alla rampa $Y(s) = \frac{10s^2 + 50s}{s^2 + 11s + 10} \cdot \frac{1}{s^2} = \frac{5}{s} - \frac{40/9}{s+1} - \frac{5/9}{s+10}$

$y(t) = \left[5 - \frac{40}{9} e^{-t} - \frac{5}{9} e^{-10t} \right] 1(t)$

3) $Y(z) = \frac{z+1}{z-\frac{1}{2}} \cdot \frac{z}{z-1} = z \left(\frac{4}{z-1} - \frac{3}{z-\frac{1}{2}} \right) \Rightarrow y(k) = \left[4 - 3 \left(\frac{1}{2} \right)^k \right] 1(k)$

Visto che $\frac{-5}{\ln(\frac{1}{2})} = 7,21$, il tutto si esaurisce dopo 8 campioni

$k=0 \quad y=1$
 $k=1 \quad y=4 - \frac{3}{2} = 2.5$
 $k=2 \quad y=4 - \frac{3}{2^2} = 3.25$

⋮
⋮

