terzo test di autovalutazione di FONDAMENTI DI AUTOMATICA A.A. 2020/21

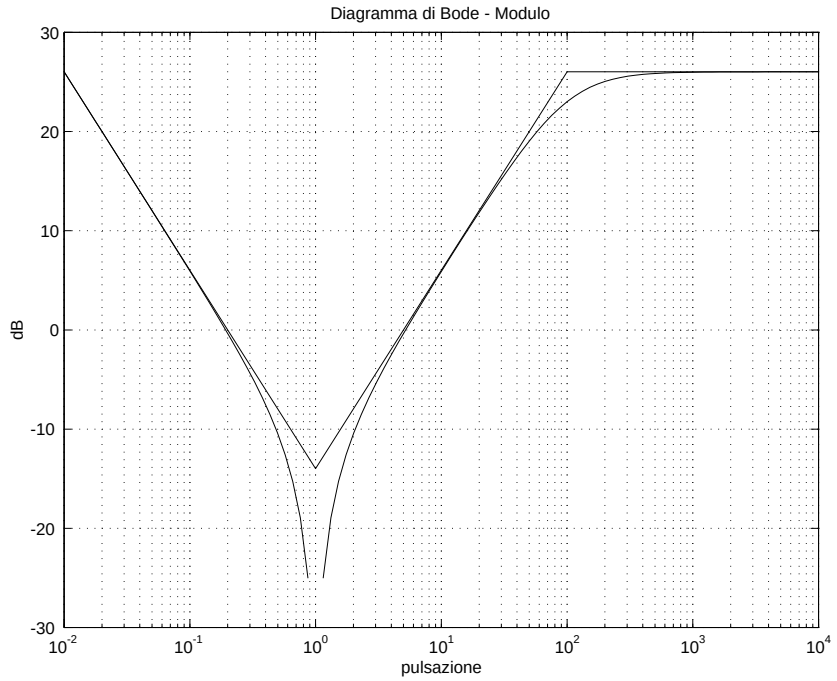
Data: 28 Ottobre 2020

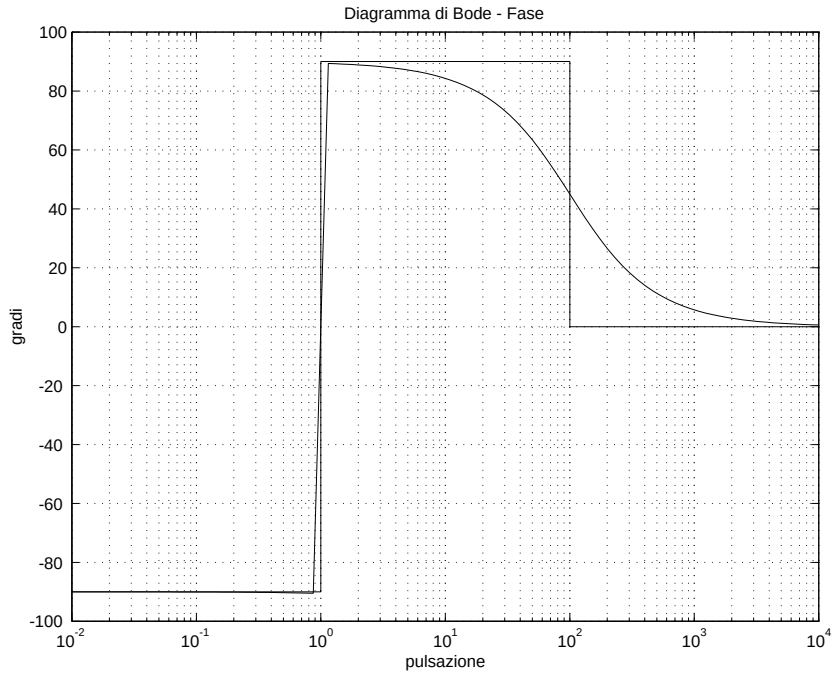
1. Si traccino i diagrammi di Bode (reali e asintotici) delle seguenti funzioni di trasferimento:
   (a) $W(s) = 20\ \dfrac{s^2+1}{s(s+100)}$;
   (b) $W(s) = -\ \dfrac{s-100}{s(s^2+0.1s+1)}$;
   (c) $W(s) = \dfrac{s^2+2s+10}{(s-10)(s+10)}$;
   (d) $W(s) = \dfrac{s+100}{s^2+0.25s+1}$;
   (e) $W(s) = \dfrac{s(s+1)}{s^2-0.01s+1}$;
   (f) $W(s) = \dfrac{(s+10)^2}{s^2+10}$.
2. Si traccino i diagrammi di Bode (reali e asintotici) delle seguenti funzioni di trasferimento, e, partire da essi, si traccino in modo approssimativo i corrispondenti diagrammi di Nyquist:
   (a) $W(s) = \dfrac{s+1}{s(s+100)}$;
   (b) $W(s) = \dfrac{s}{s^2-10}$;
   (c) $W(s) = \dfrac{s^2+1}{s^2+2s+101}$.
3. Si traccino i diagrammi di Nyquist delle seguenti funzioni di trasferimento (i cui diagrammi di Bode sono stati chiesti al punto 1):
   (a) $W(s) = 20\ \dfrac{s^2+1}{s(s+100)}$;
   (b) $W(s) = -\ \dfrac{s-100}{s(s^2+0.1s+1)}$;
   (e) $W(s) = \dfrac{s(s+1)}{s^2-0.01s+1}$.

RISPOSTE

1. Diagrammi di Bode:

   (a)





(b)

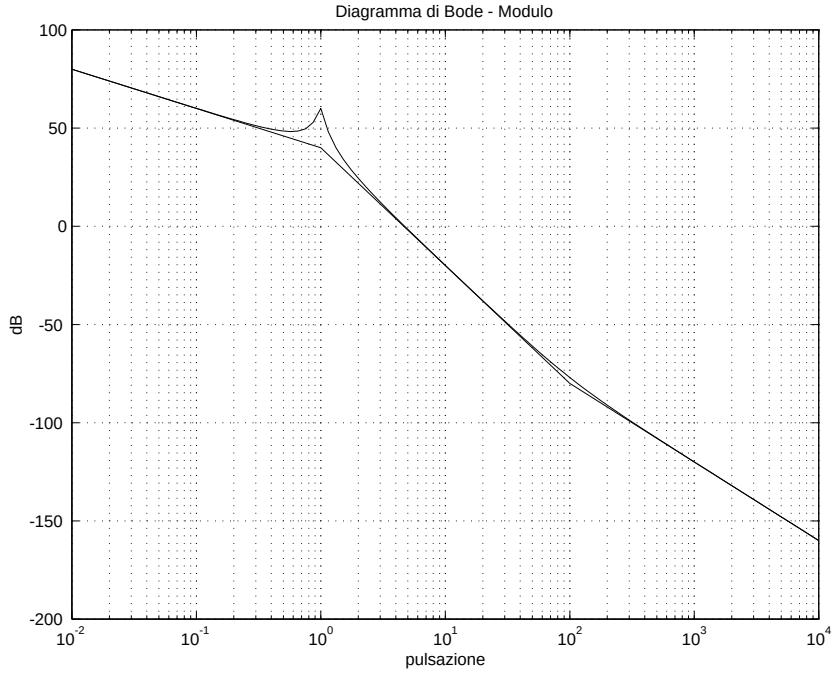


Diagramma di Bode - Modulo
100
50
0
-50
-100
-150
-200
dB
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
pulsazione

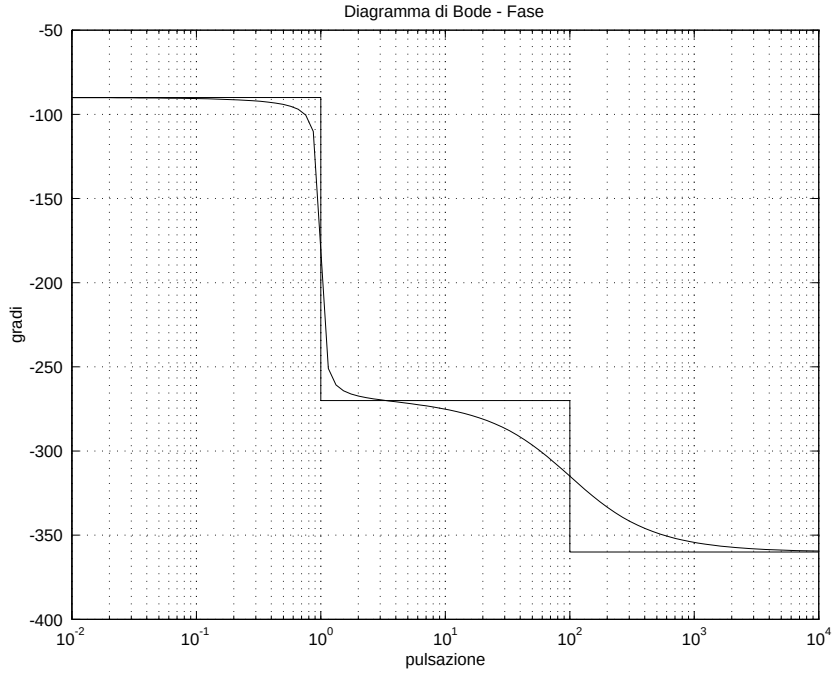


Diagramma di Bode - Fase
-50
-100
-150
-200
-250
-300
-350
-400
gradi
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
pulsazione

(c)

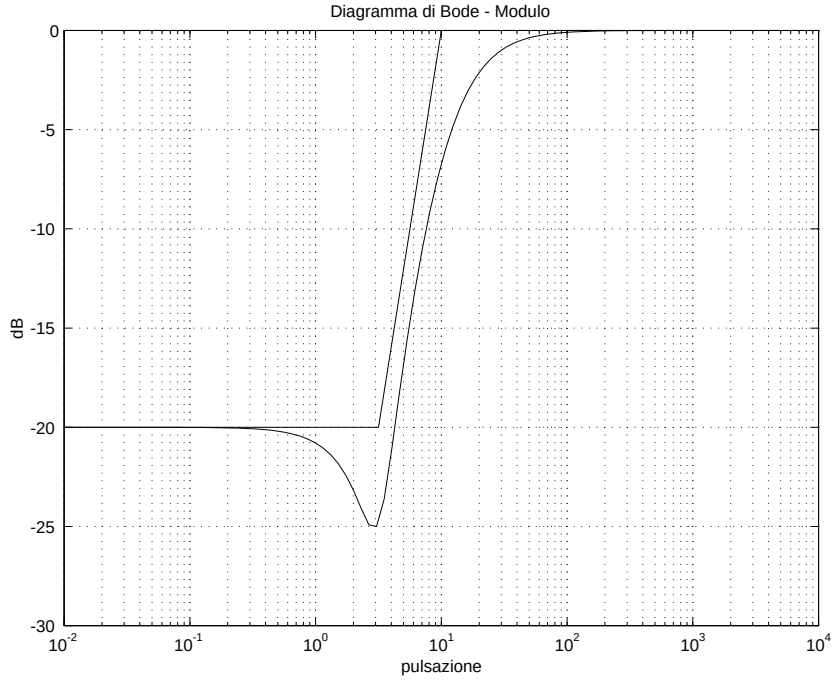


Diagramma di Bode - Modulo
dB
pulsazione
0
-5
-10
-15
-20
-25
-30
10^-2
10^-1
10^0
10^1
10^2
10^3
10^4

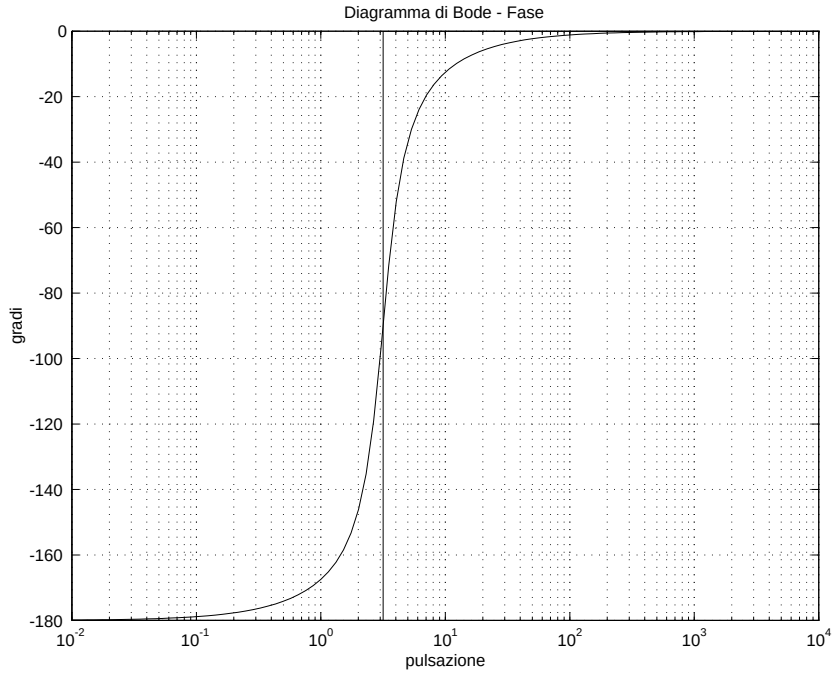


Diagramma di Bode - Fase
gradi
pulsazione
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
10^-2
10^-1
10^0
10^1
10^2
10^3
10^4

(d)

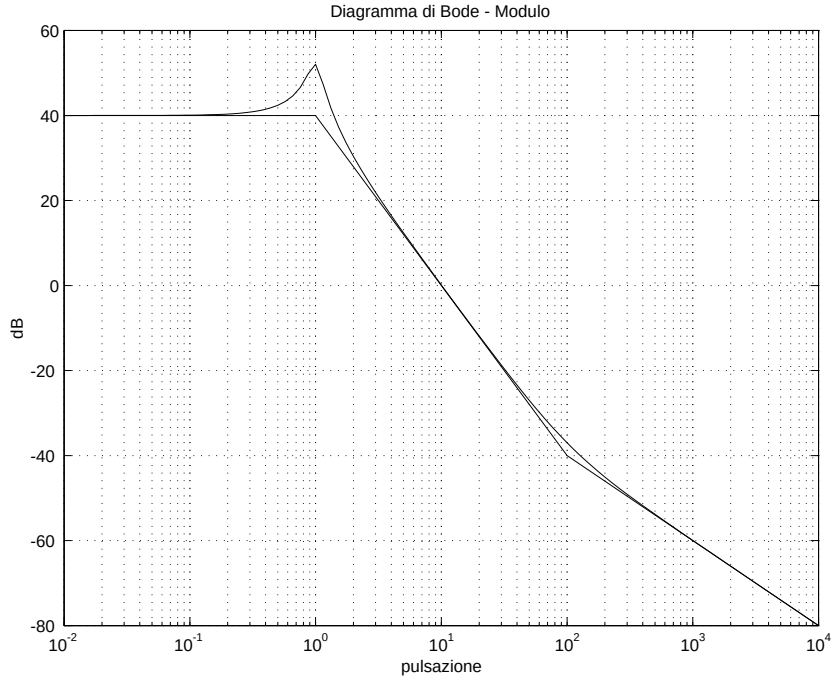


Diagramma di Bode - Modulo
dB
pulsazione
60
40
20
0
-20
-40
-60
-80
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}

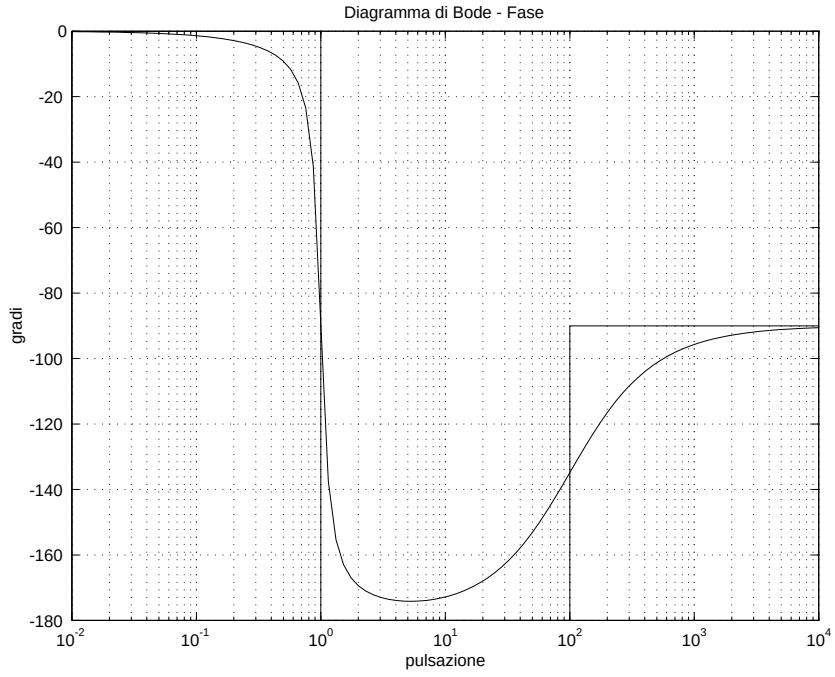


Diagramma di Bode - Fase
gradi
pulsazione
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}

(e)

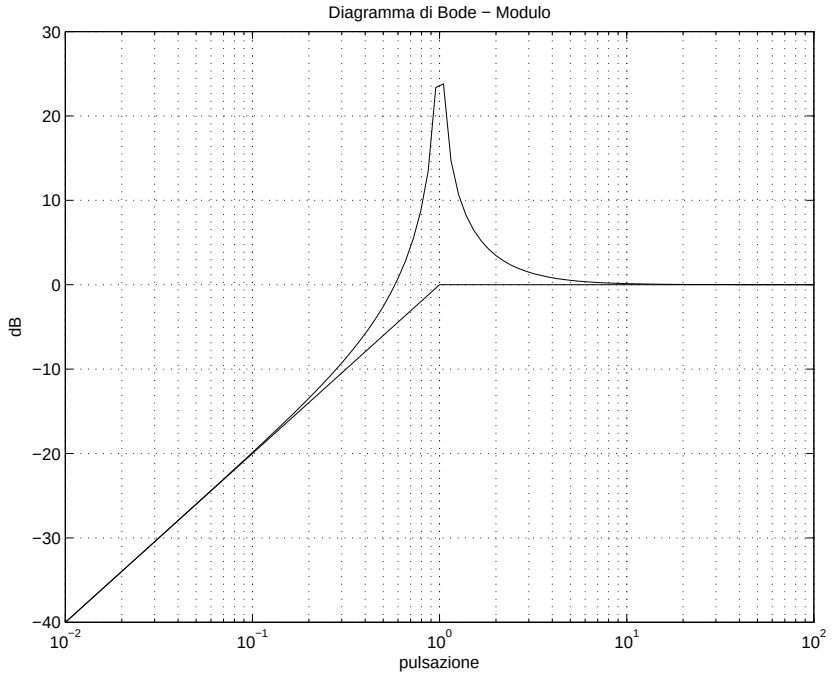


Diagramma di Bode − Modulo
dB
pulsazione
30
20
10
0
−10
−20
−30
−40
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}

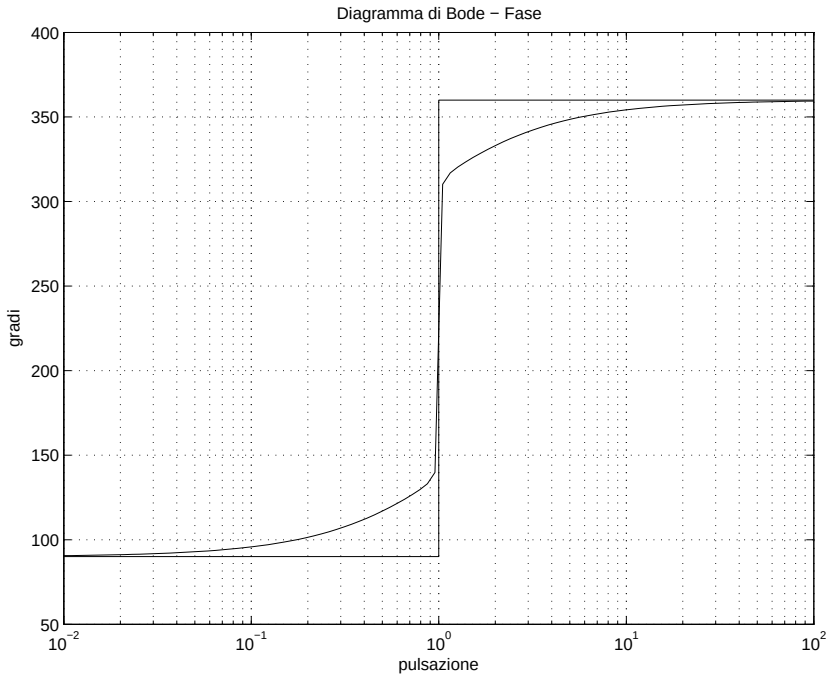


Diagramma di Bode − Fase
gradi
pulsazione
400
350
300
250
200
150
100
50
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}

(f)

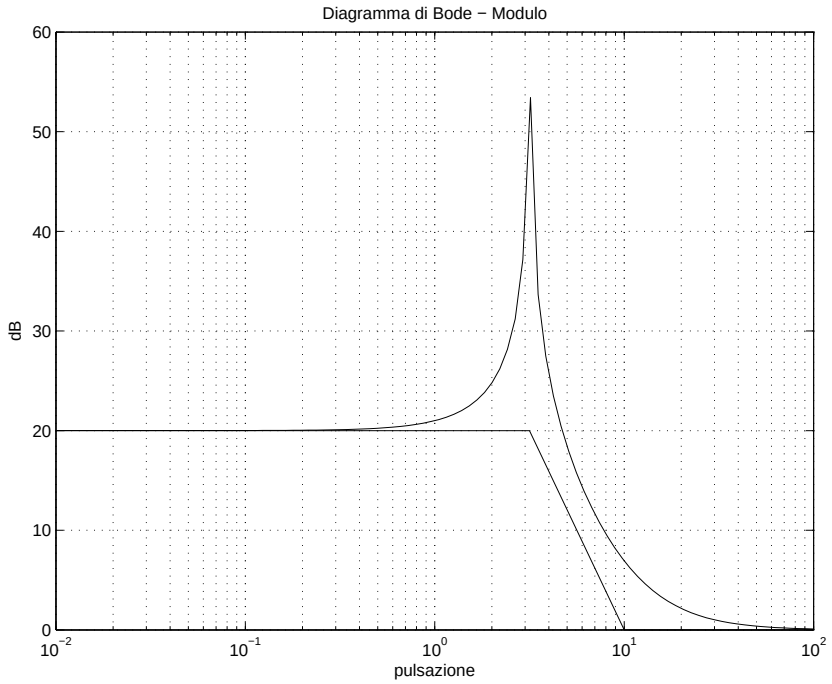


Diagramma di Bode − Modulo
dB
pulsazione
60
50
40
30
20
10
0
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}

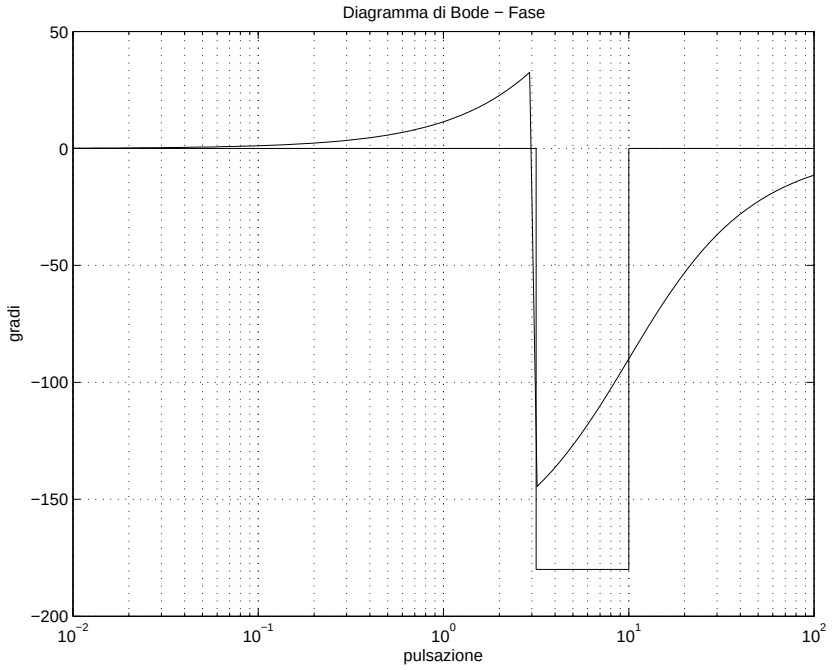
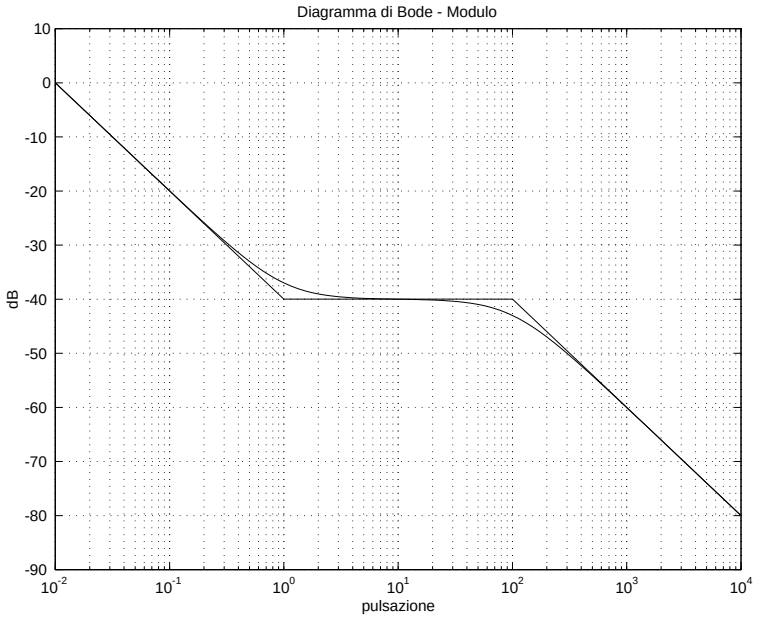
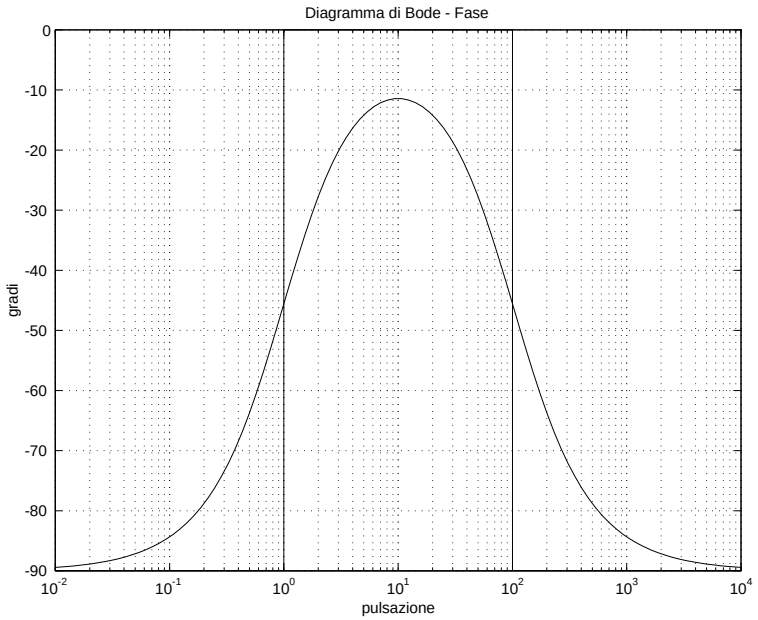


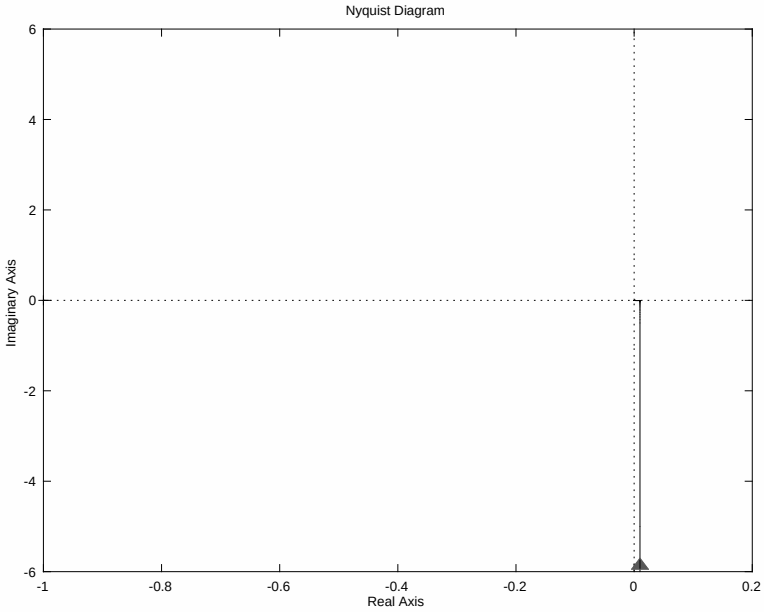
Diagramma di Bode − Fase
gradi
pulsazione
50
0
−50
−100
−150
−200
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}

2. Diagrammi di Bode e di Nyquist:

(a)






Nyquist Diagram
Imaginary Axis
Real Axis
6
4
2
0
-2
-4
-6
-1
-0.8
-0.6
-0.4
-0.2
0
0.2

(b)

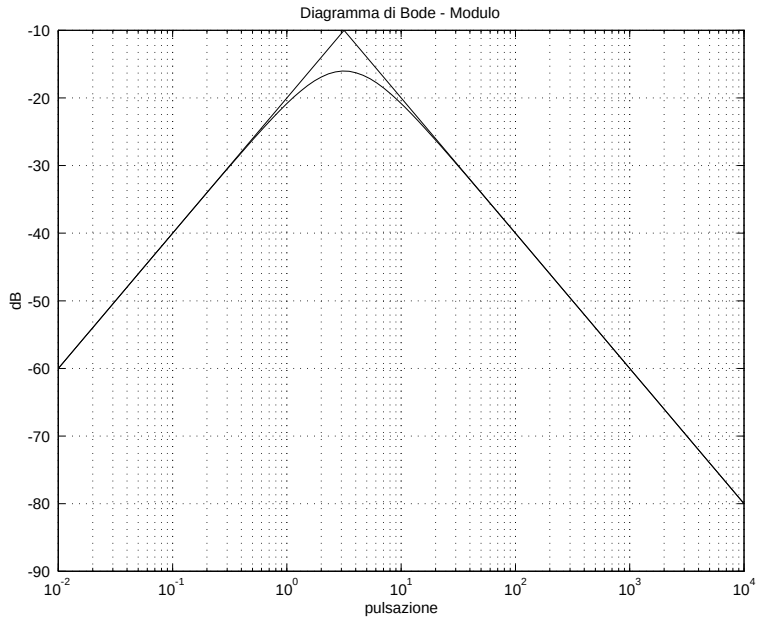


Diagramma di Bode - Modulo
dB
pulsazione
-10
-20
-30
-40
-50
-60
-70
-80
-90
10^-2
10^-1
10^0
10^1
10^2
10^3
10^4

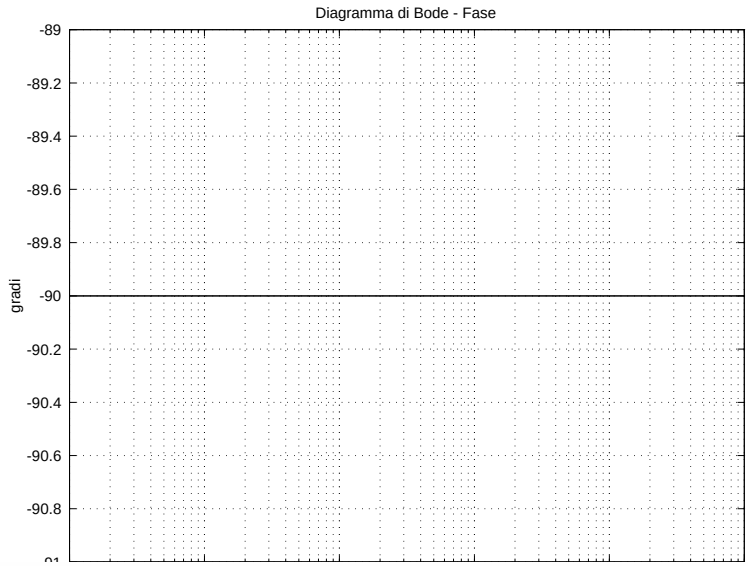
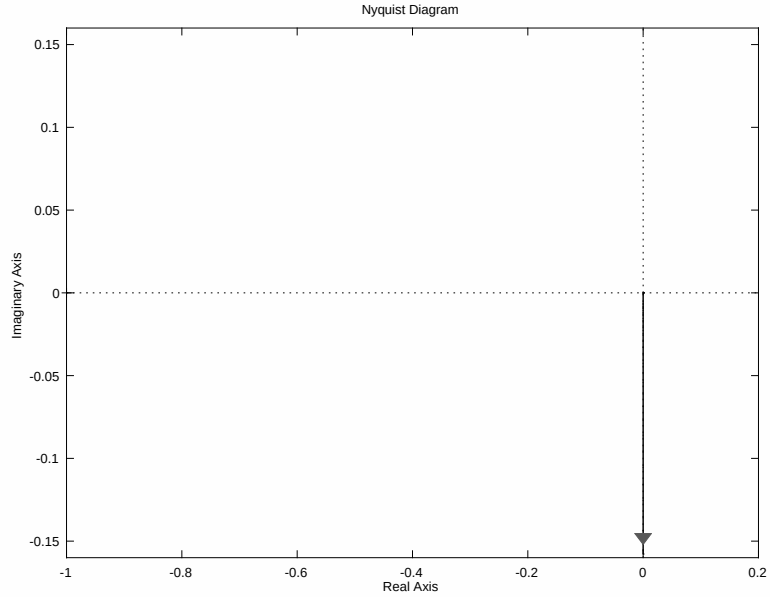


Diagramma di Bode - Fase
gradi
-89
-89.2
-89.4
-89.6
-89.8
-90
-90.2
-90.4
-90.6
-90.8


Nyquist Diagram
Imaginary Axis
Real Axis
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-1
-0.8
-0.6
-0.4
-0.2
0
0.2

(c)

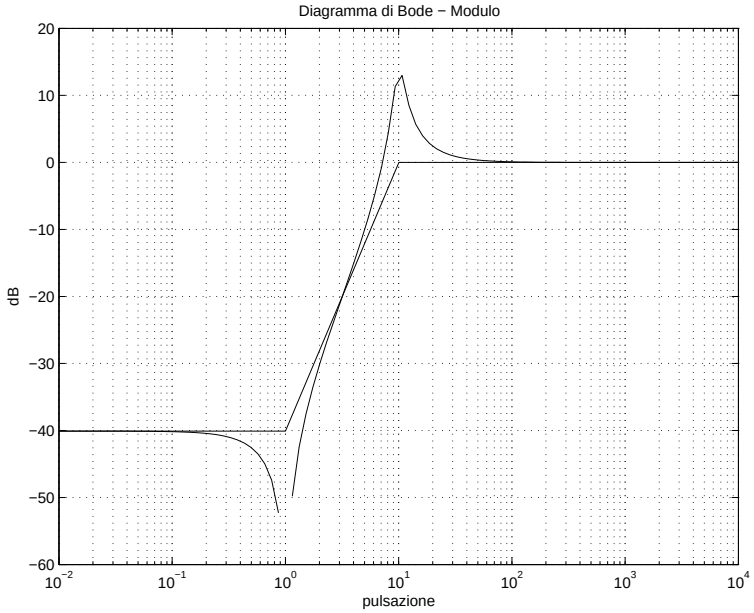


Diagramma di Bode − Modulo
dB
pulsazione

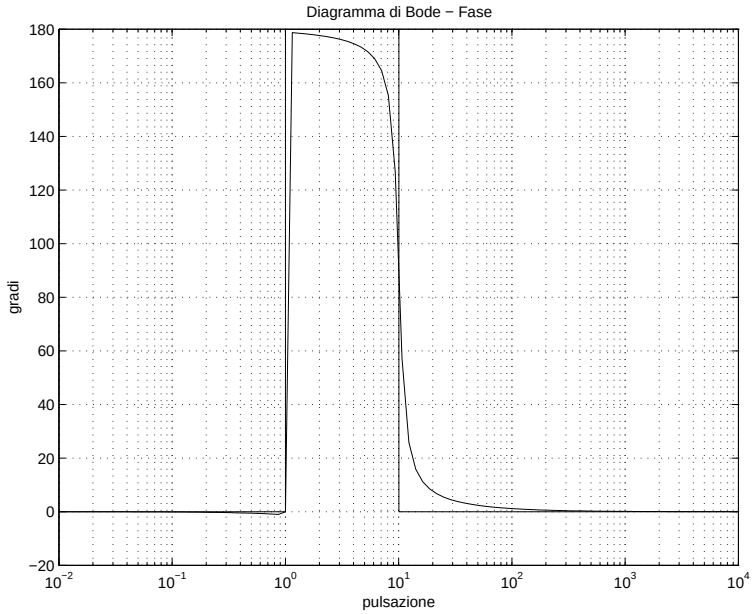
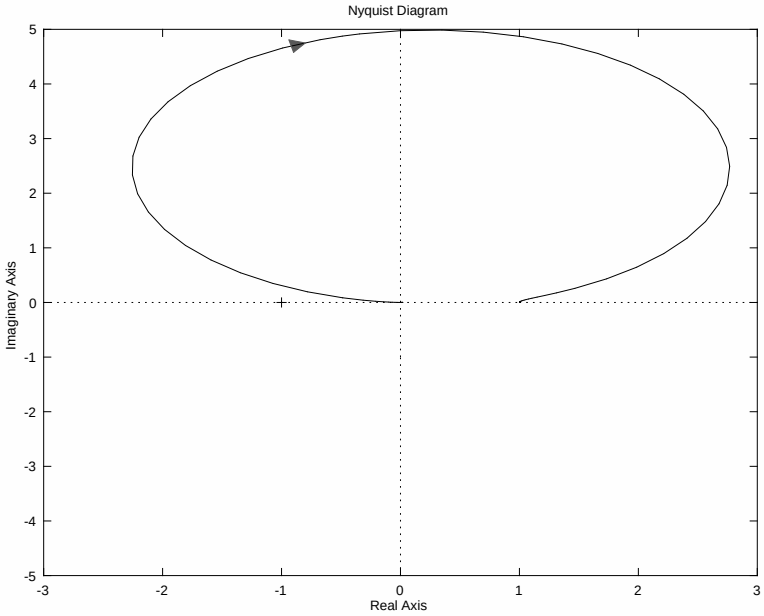
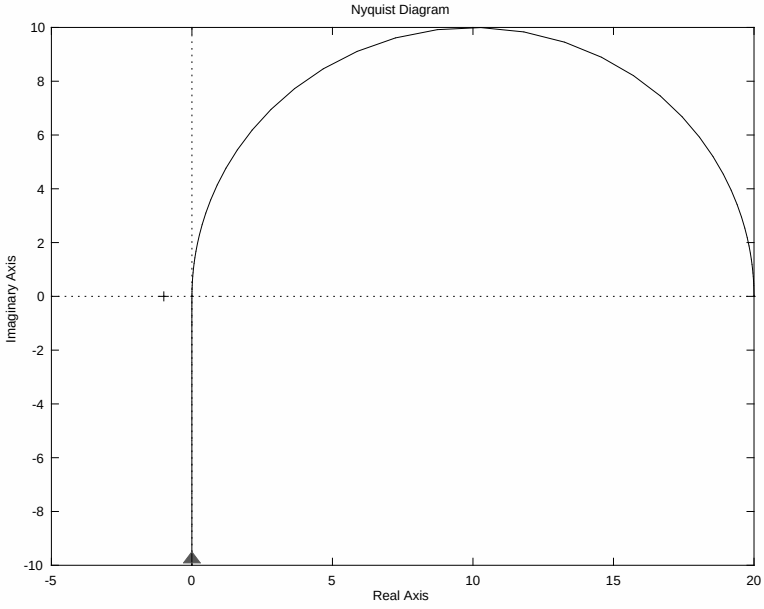
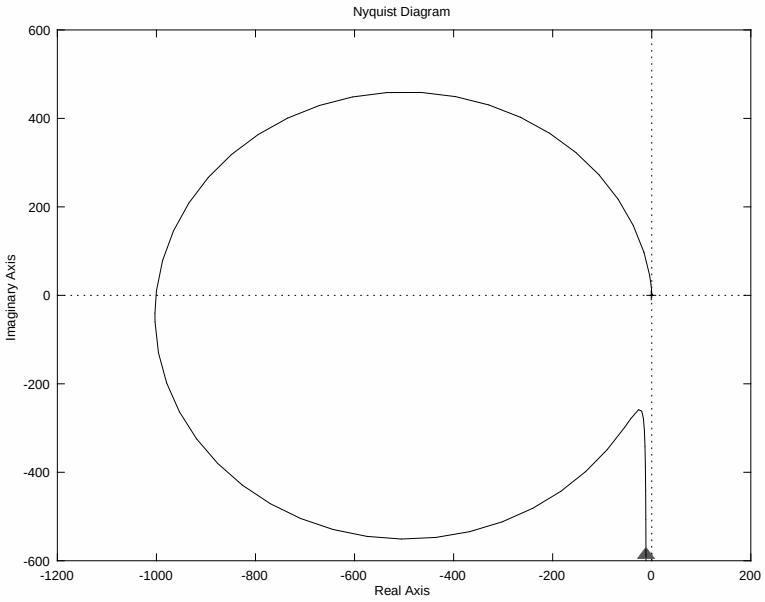


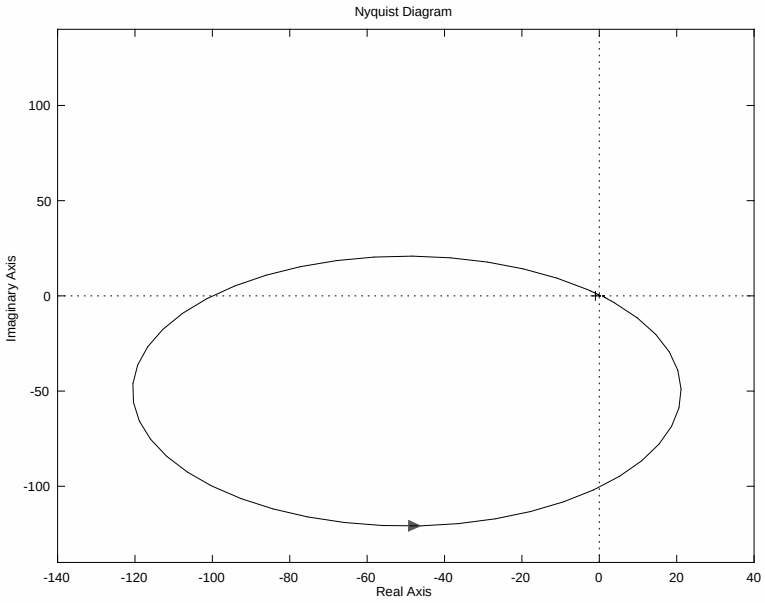
Diagramma di Bode − Fase
gradi
pulsazione


Nyquist Diagram
Imaginary Axis
Real Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-3
-2
-1
0
1
2
3

3.


Nyquist Diagram
Imaginary Axis
Real Axis
10
8
6
4
2
0
-2
-4
-6
-8
-10
-5
0
5
10
15
20


Nyquist Diagram
Imaginary Axis
Real Axis
600
400
200
0
-200
-400
-600
-1200
-1000
-800
-600
-400
-200
0
200


Nyquist Diagram
Imaginary Axis
Real Axis
100
50
0
-50
-100
-140
-120
-100
-80
-60
-40
-20
0
20
40