Estabilidad relativa, Mg y Mf

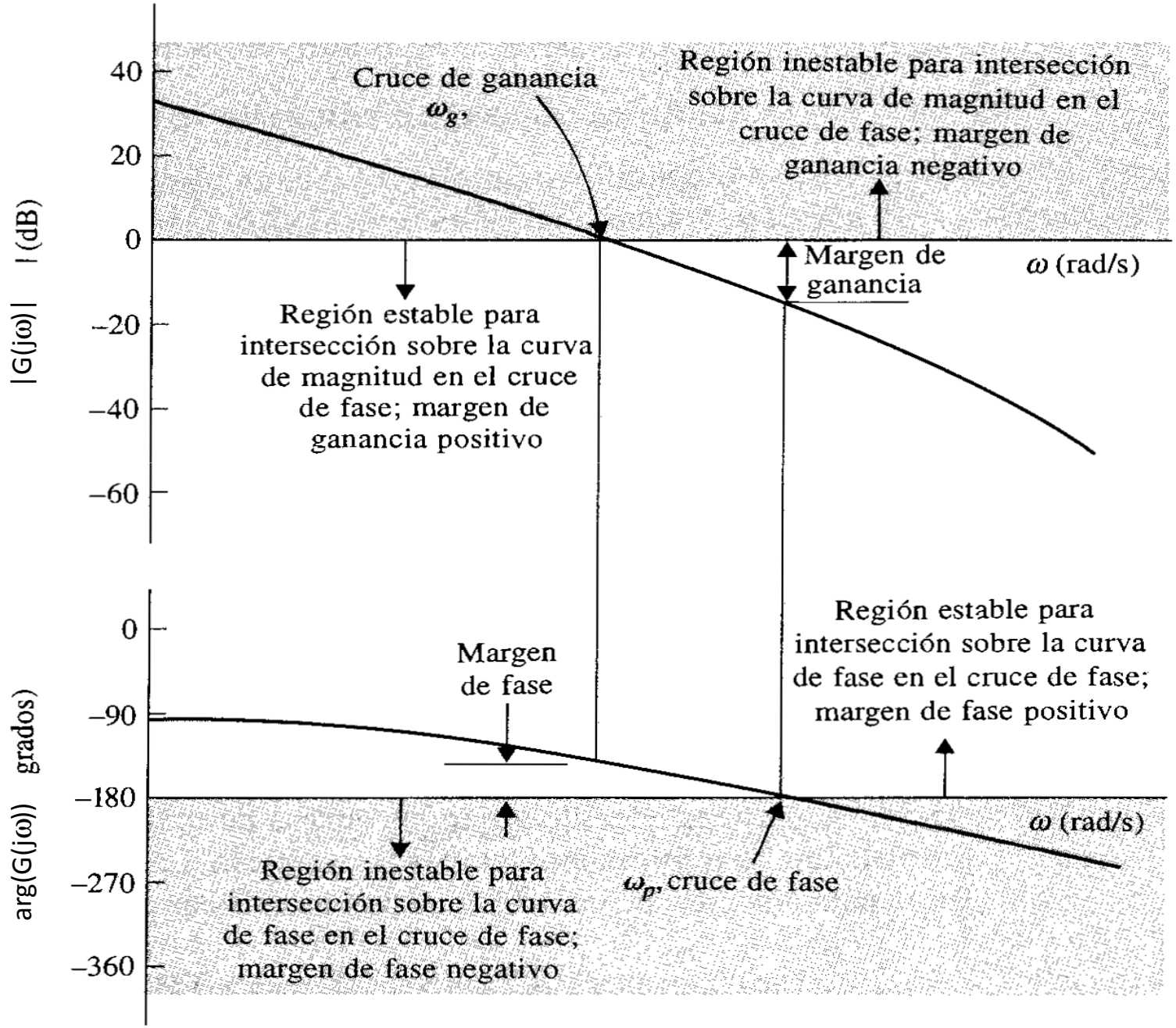
Bibliografía:

Lewis-Yang, “Sistemas de control en ingeniería” pp. 251-254

B. Kuo, “Sistemas de control automático”, 7ed. cap 9.14 (pp. 605-615)

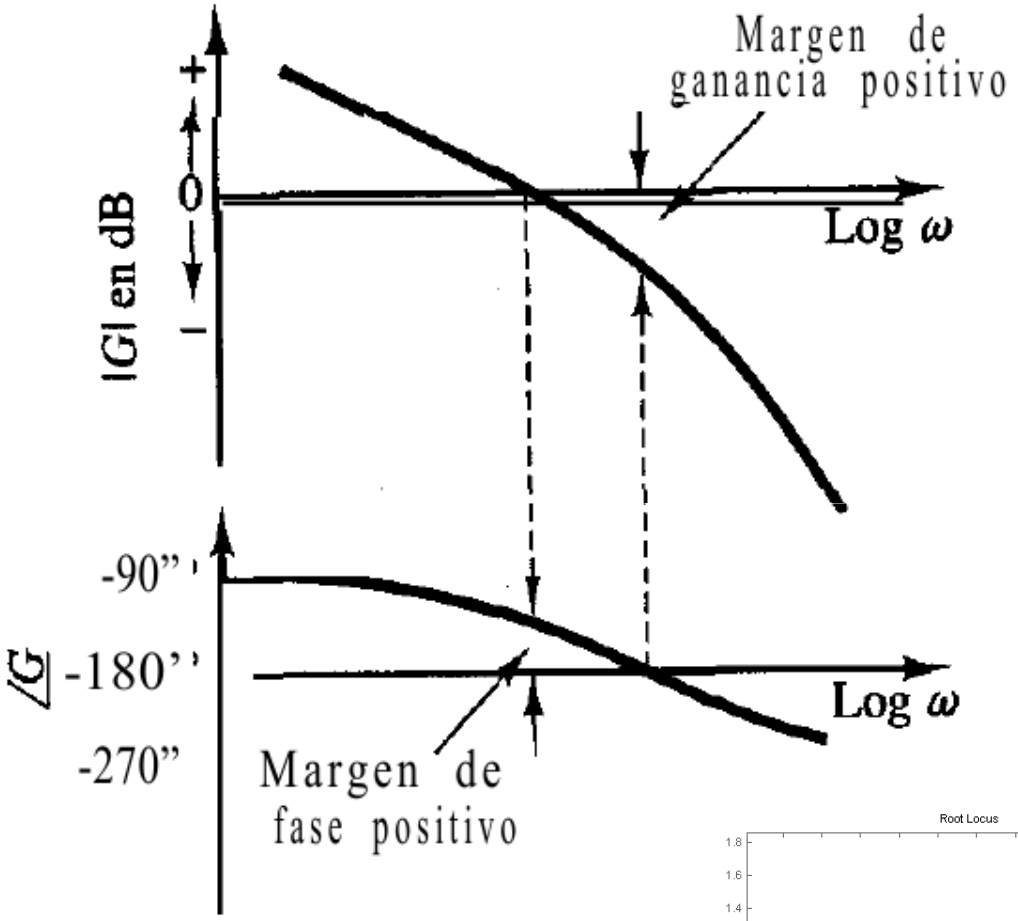
K. Ogata “Ingeniería de control moderna” 3ed. cap 8.9 (pp. 542-556)

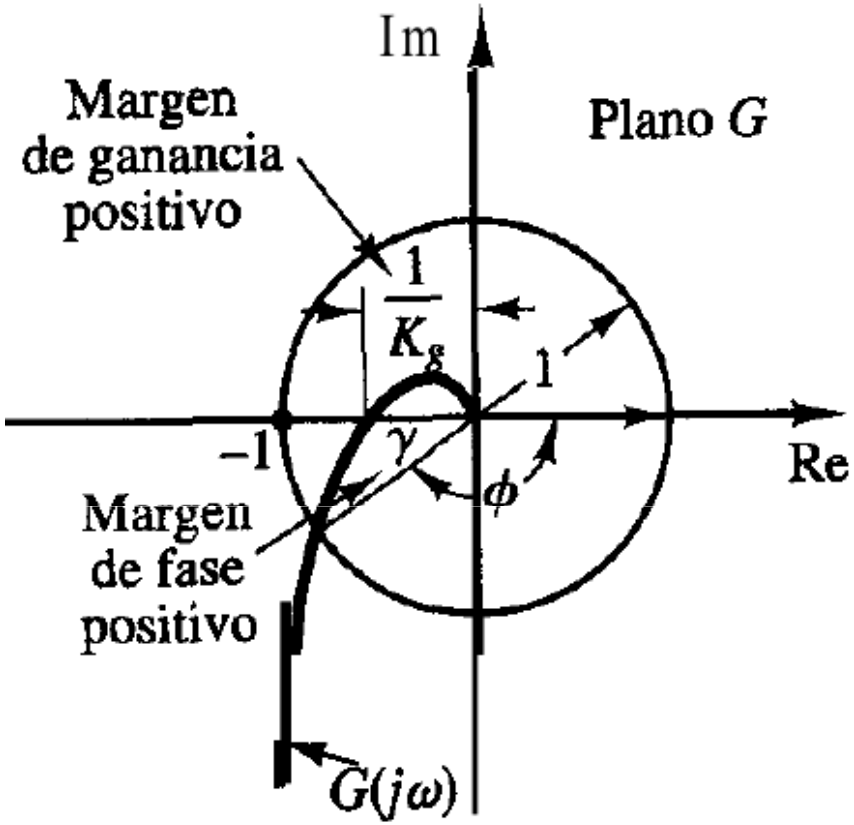
Estabilidad relativa, Mg y Mf

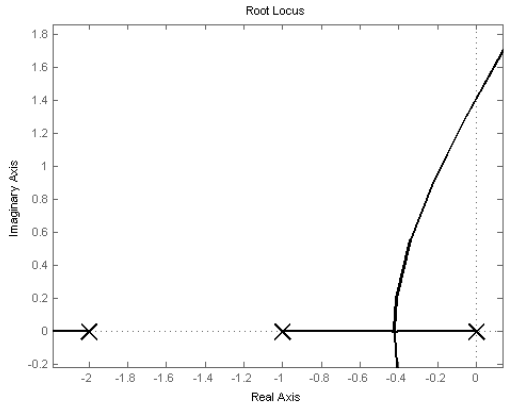


Frecuencias de cruce... de 0dB, y de -180°

Sistema estable

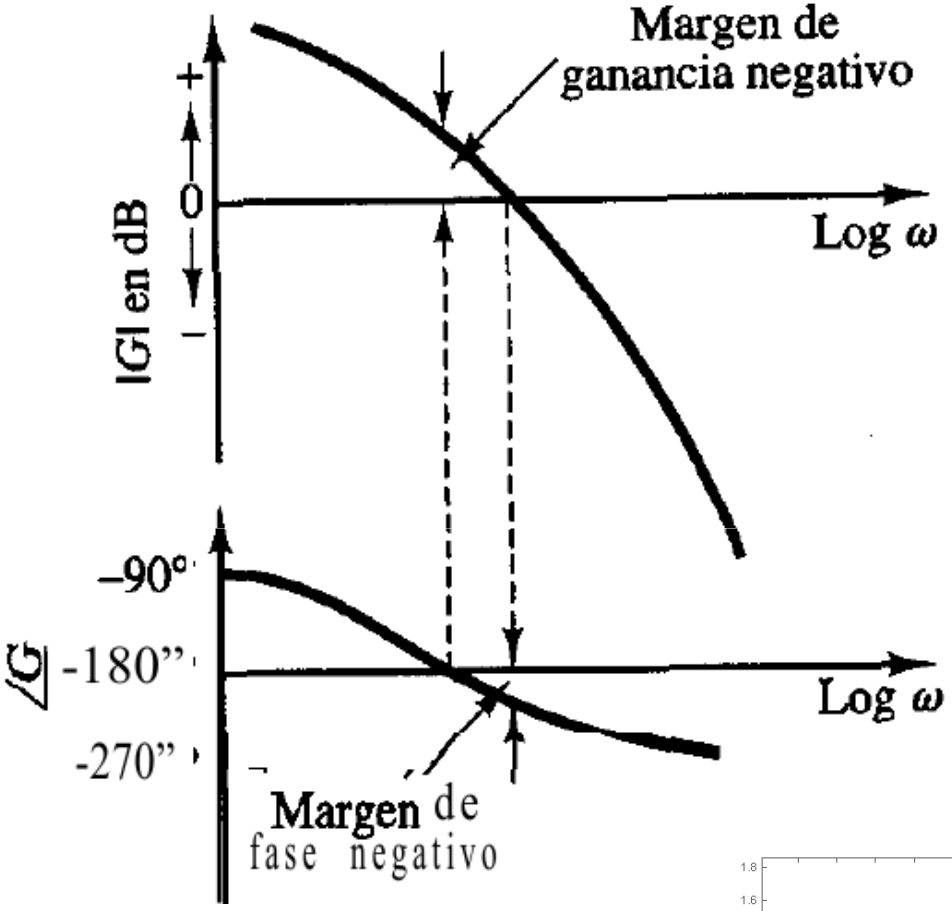


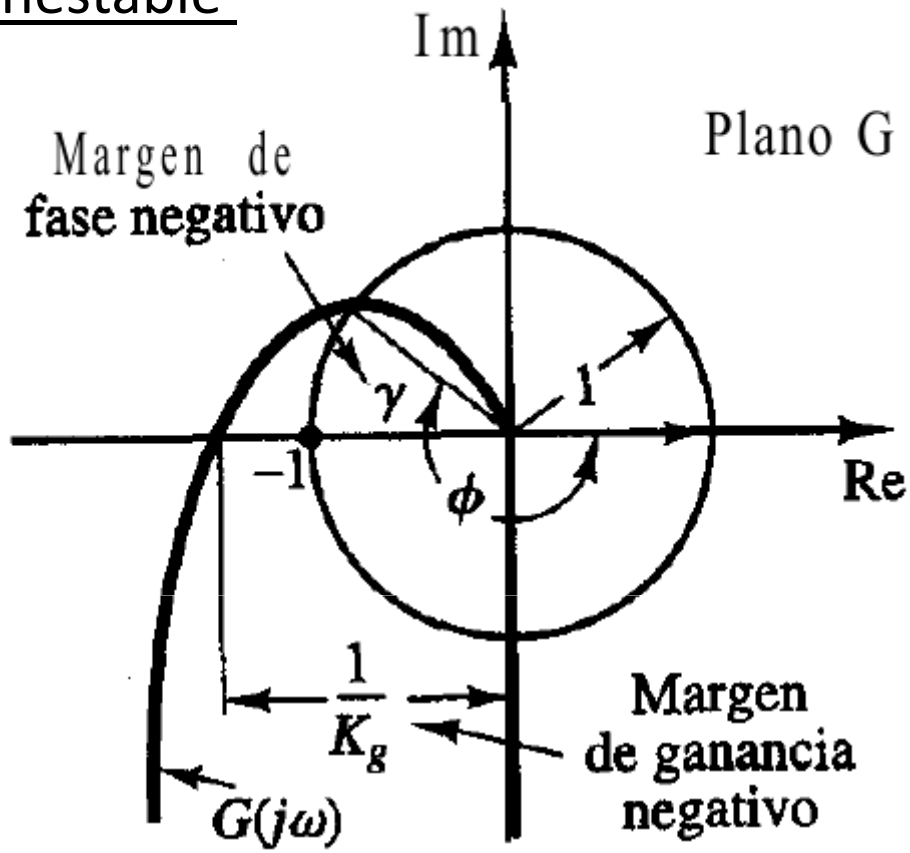


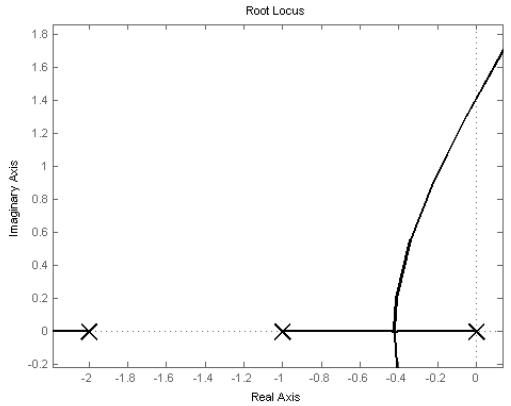


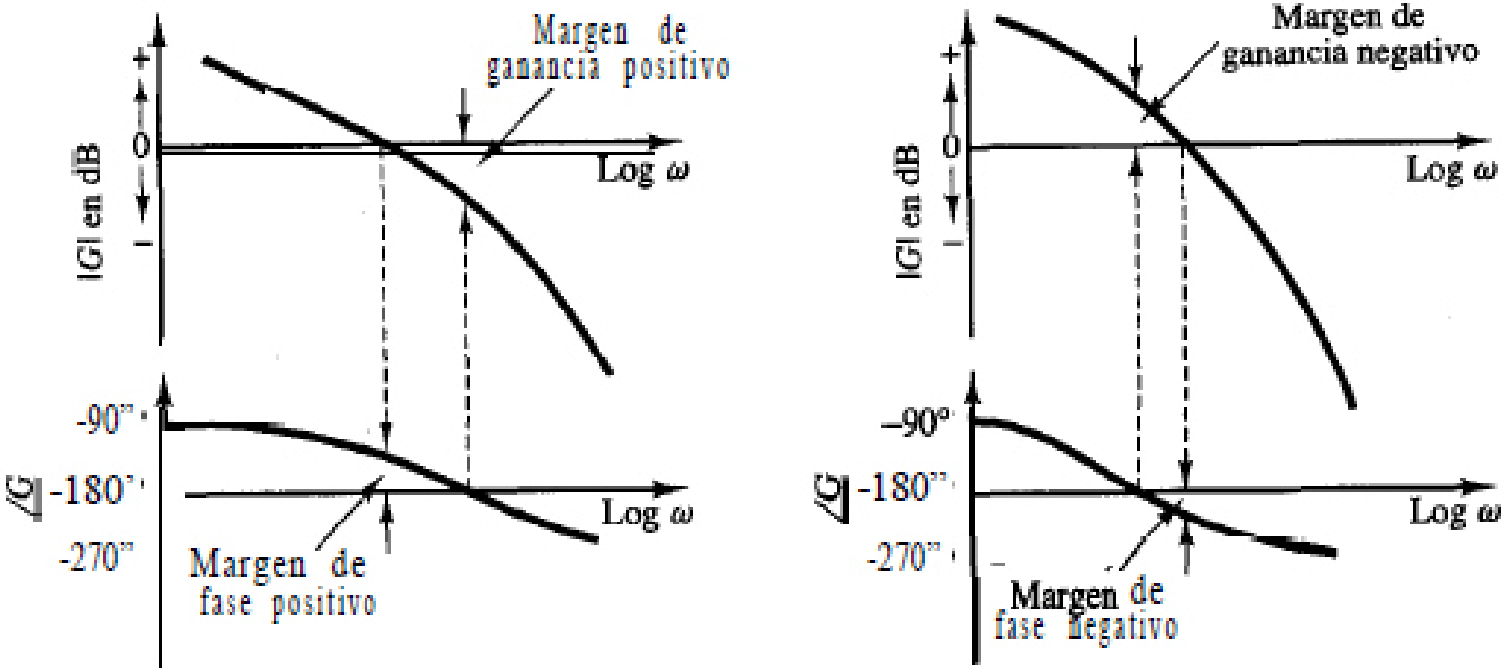
¿Diferencia de retorno?
Distancia, sensibilidad.

Sistema inestable

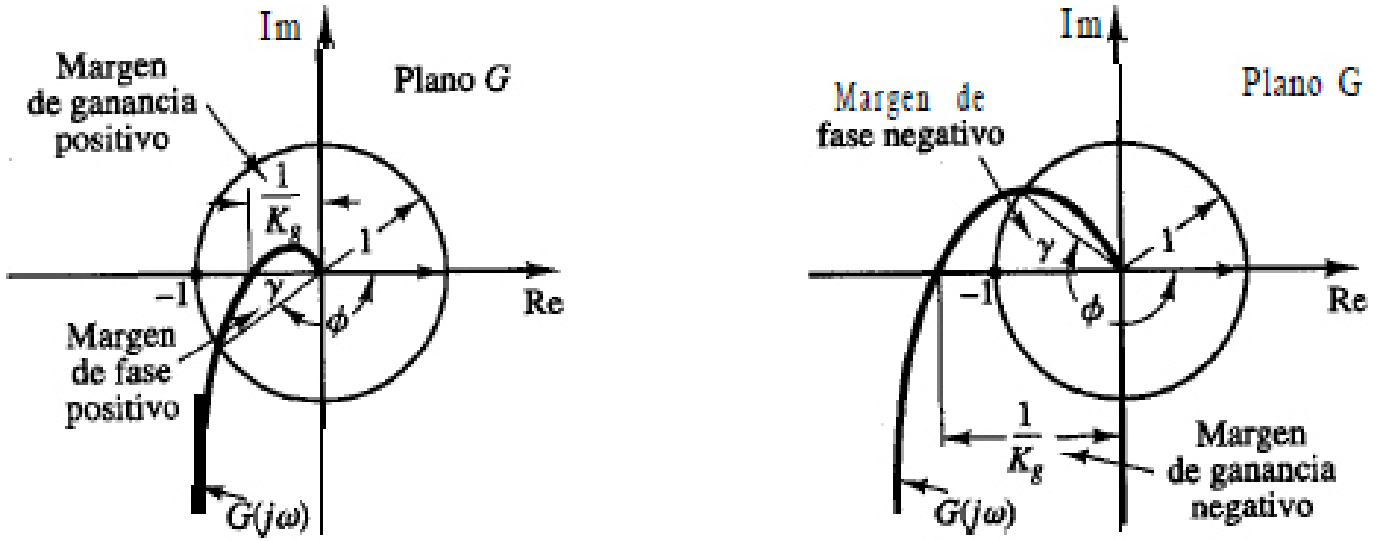




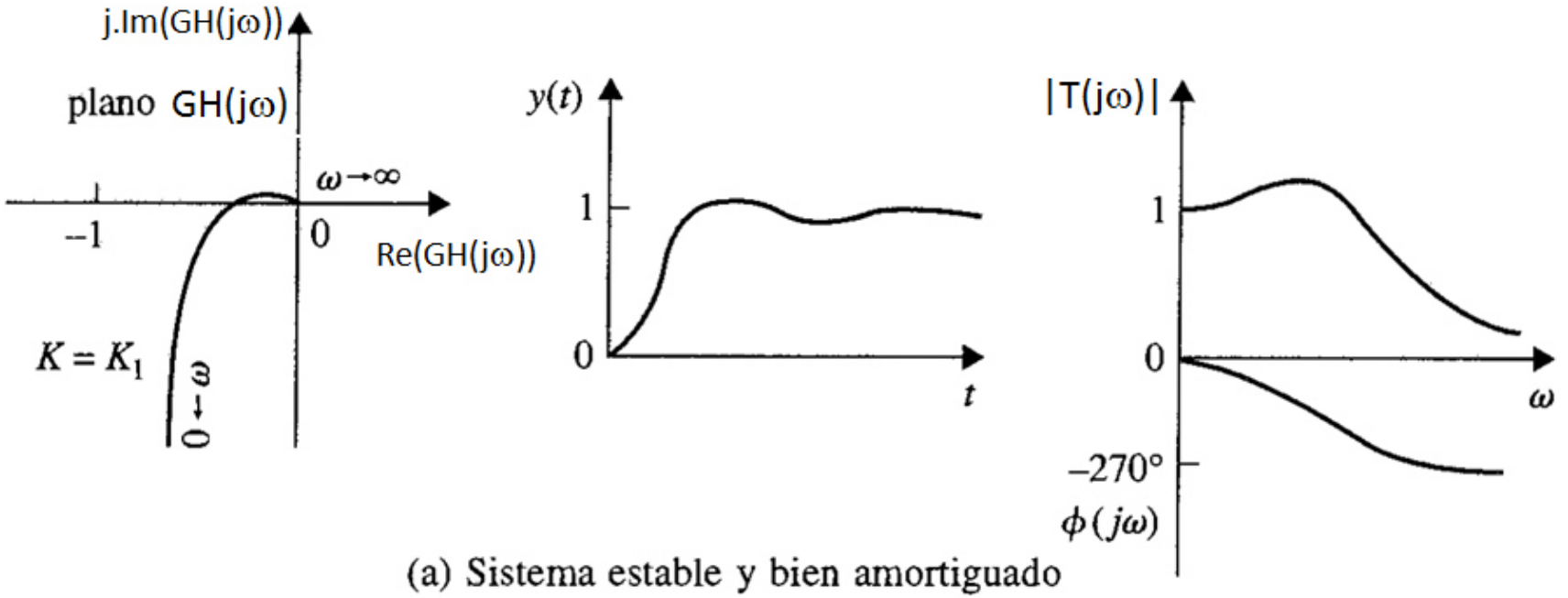



Margen de ganancia positivo
+
0
−
|G| en dB
Log ω
-90°
-180°
-270°
∠G
Log ω
Margen de fase positivo
Sistema estable
Margen de ganancia negativo
+
0
−
|G| en dB
Log ω
−90°
-180°
-270°
∠G
Log ω
Margen de fase negativo
Sistema inestable

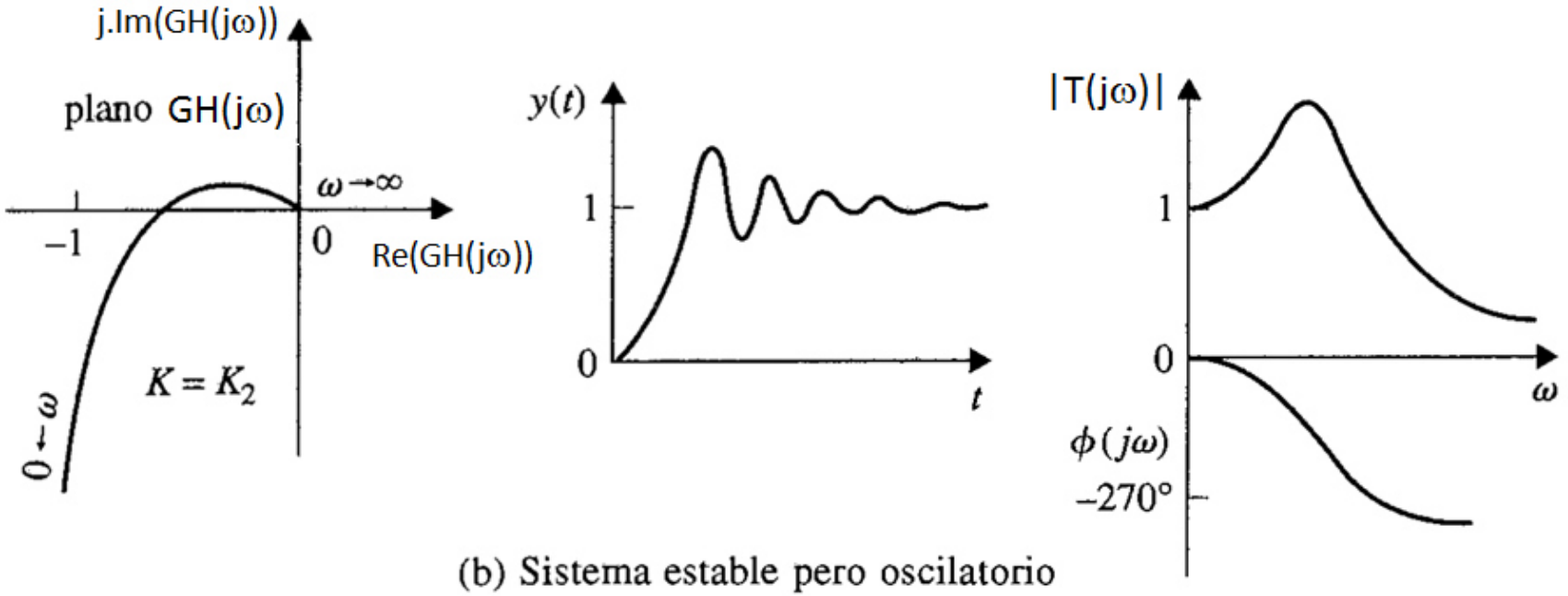
(a)


Im
Plano G
Margen de ganancia positivo
1/K_g
1
−1
γ
φ
Re
Margen de fase positivo
G(jω)
Sistema estable
Im
Plano G
Margen de fase negativo
γ
1
−1
φ
Re
1/K_g
Margen de ganancia negativo
G(jω)
Sistema inestable

(b)

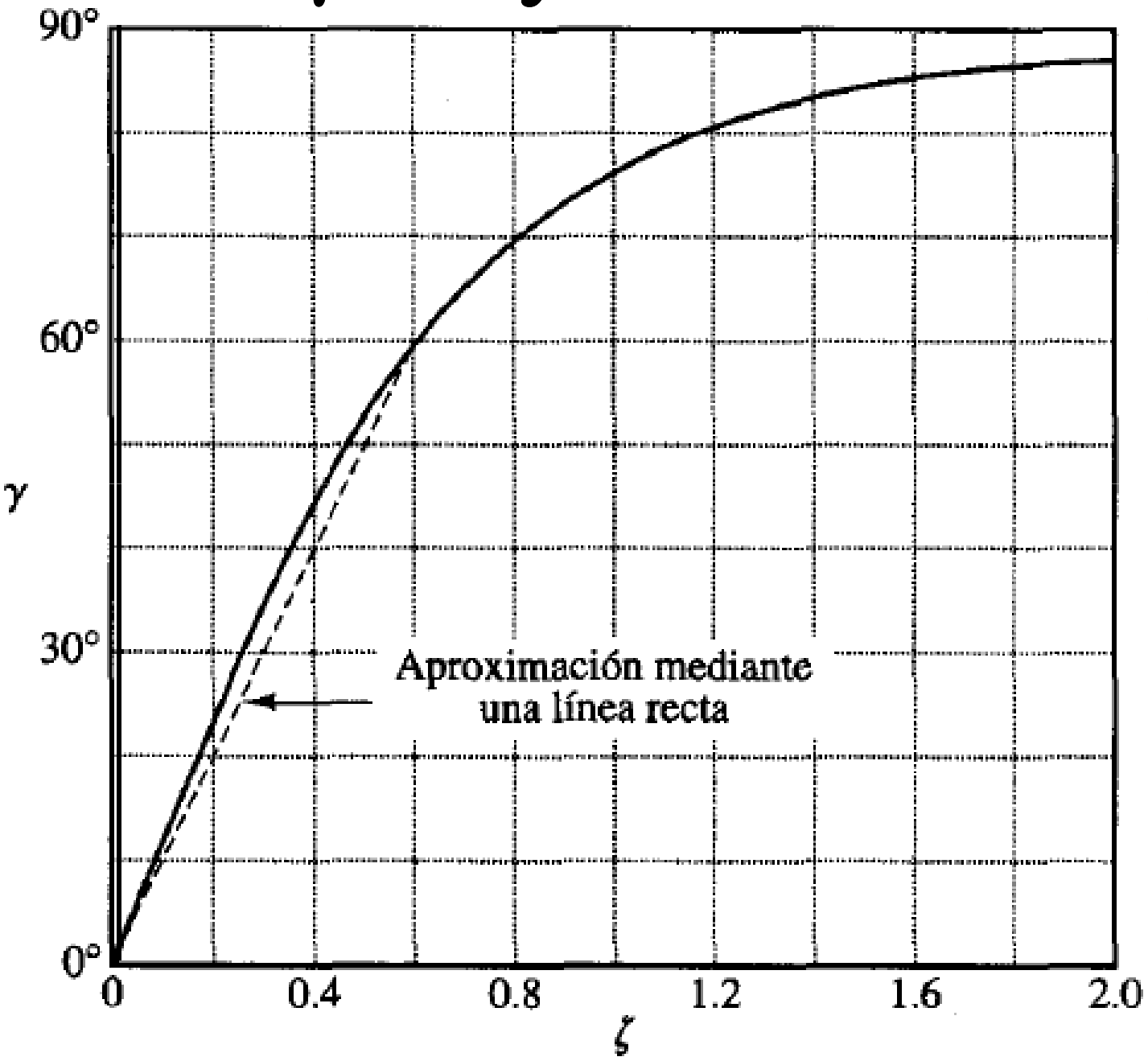


(a) Sistema estable y bien amortiguado



(b) Sistema estable pero oscilatorio

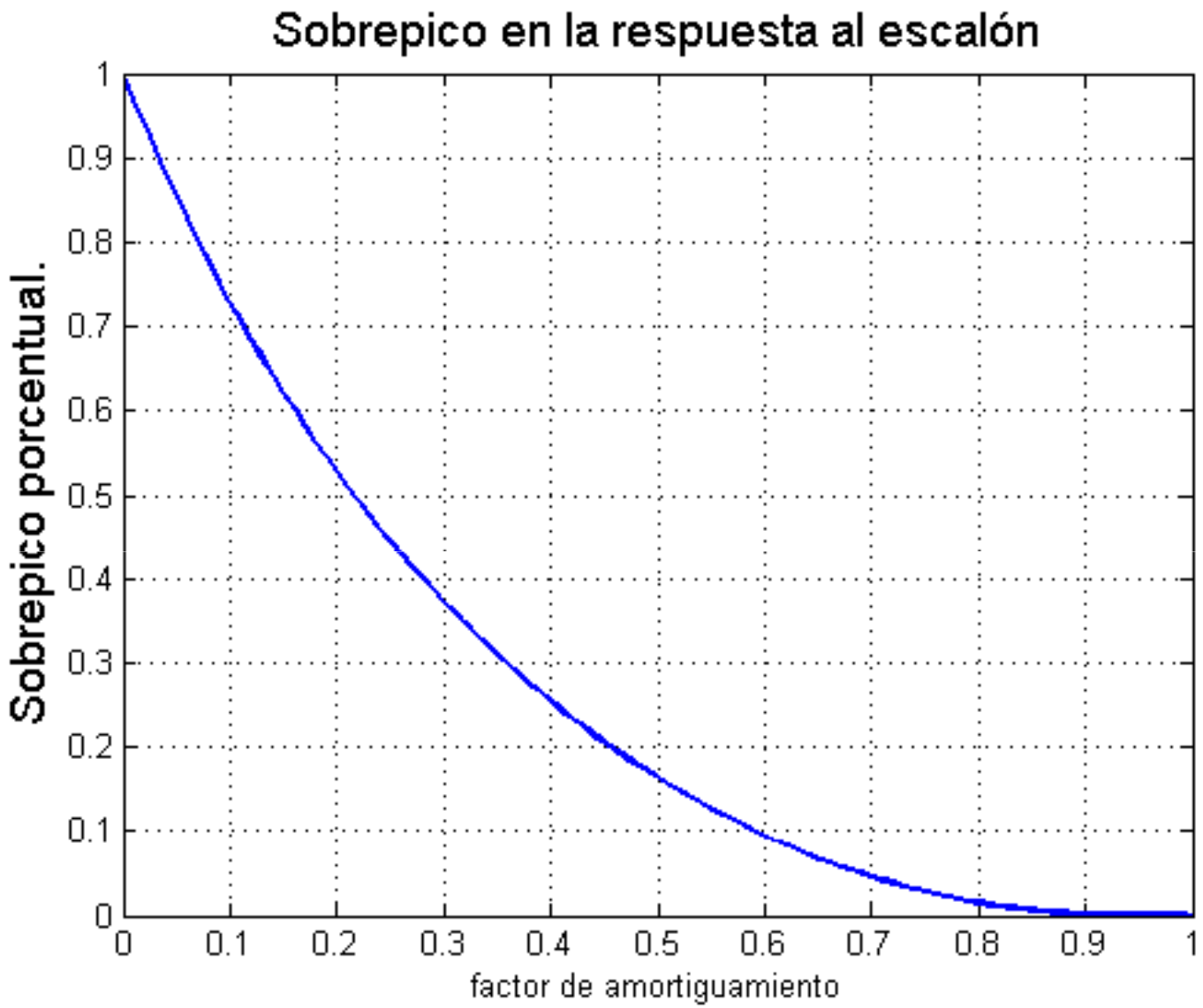
Mf=γ vs ξ, de lazo cerrado

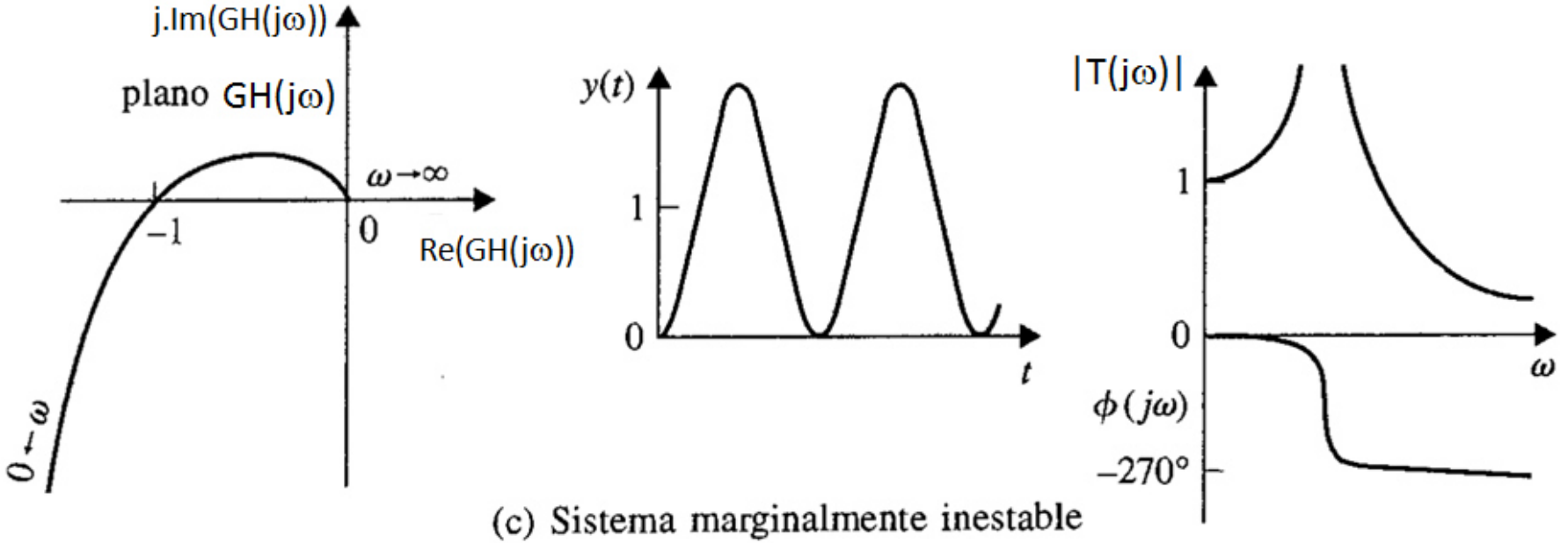


(Esto es, cuando a lazo cerrado se tiene un par complejo dominante)

para $0 \leq \zeta \leq 0.6$,

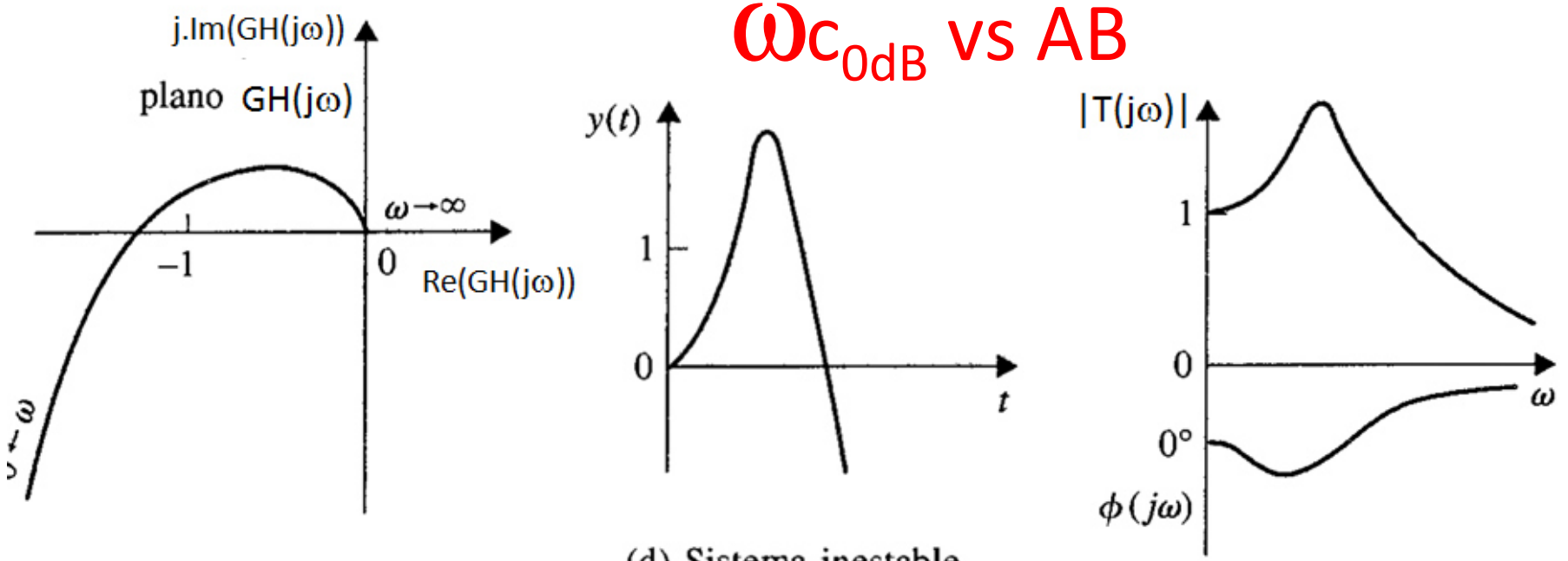
$$\zeta = \frac{\gamma}{100}$$


Sobrepico en la respuesta al escalón
Sobrepico porcentual.
factor de amortiguamiento
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

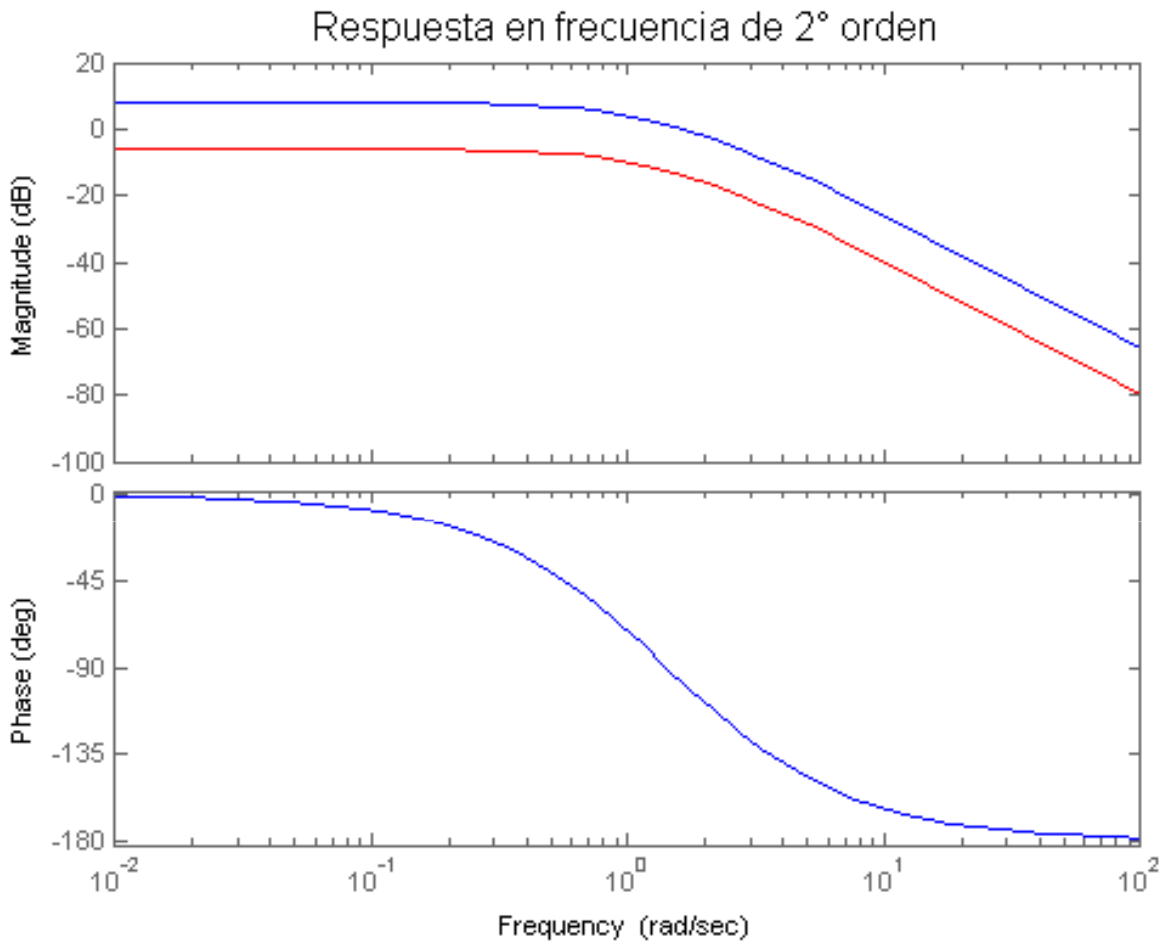


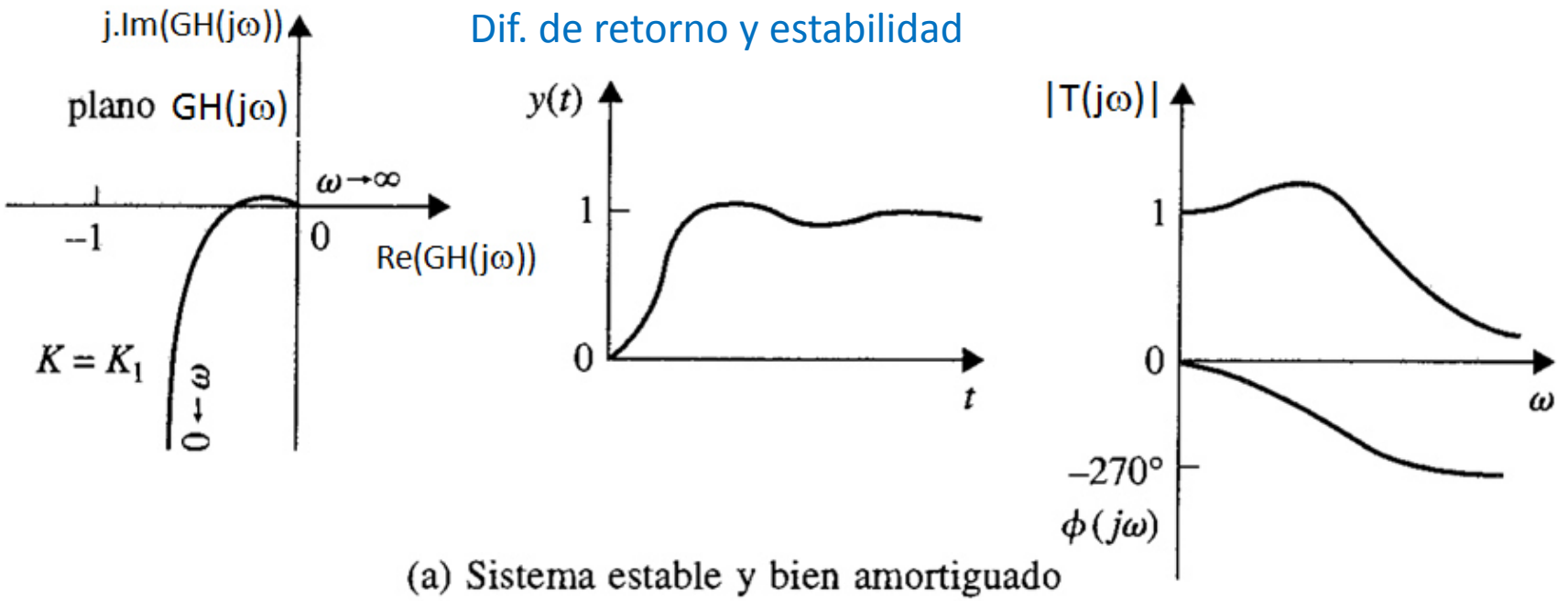
(c) Sistema marginalmente inestable

ωc_{0dB} vs AB

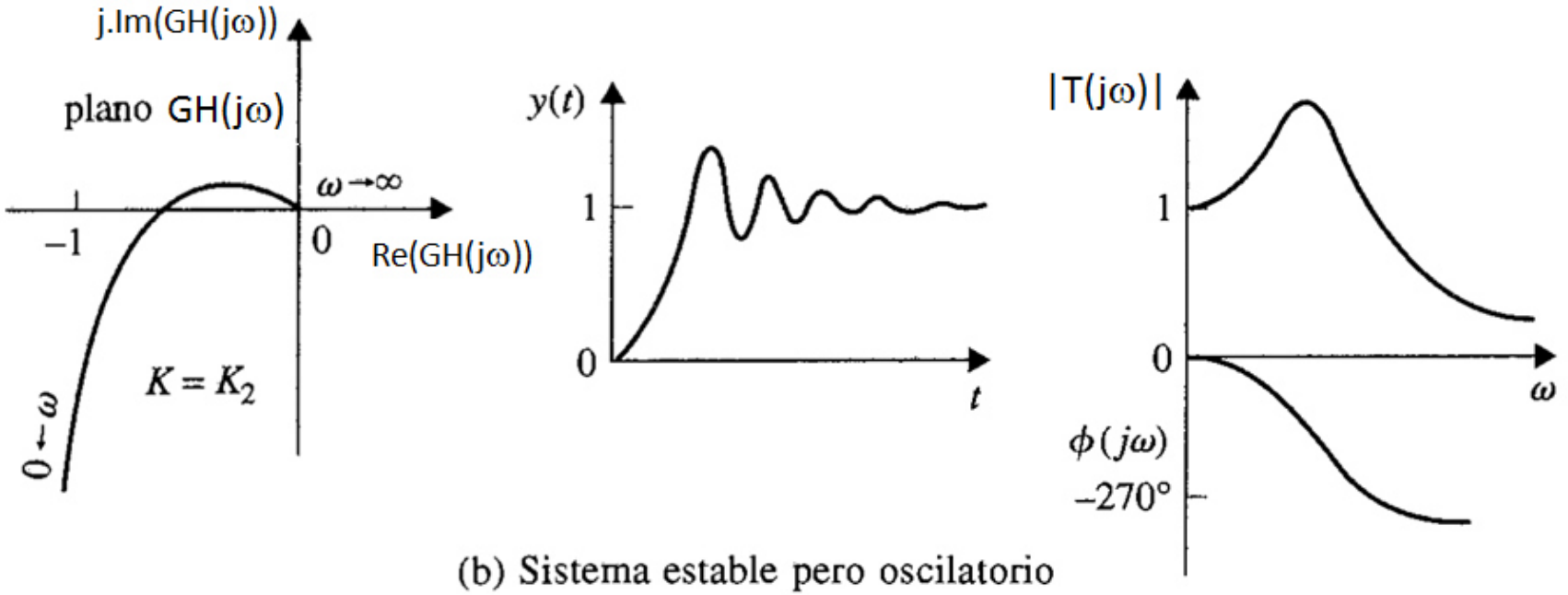


(d) Sistema inestable


Respuesta en frecuencia de 2° orden
Magnitude (dB)
20
0
-20
-40
-60
-80
-100
Phase (deg)
0
-45
-90
-135
-180
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
Frequency (rad/sec)

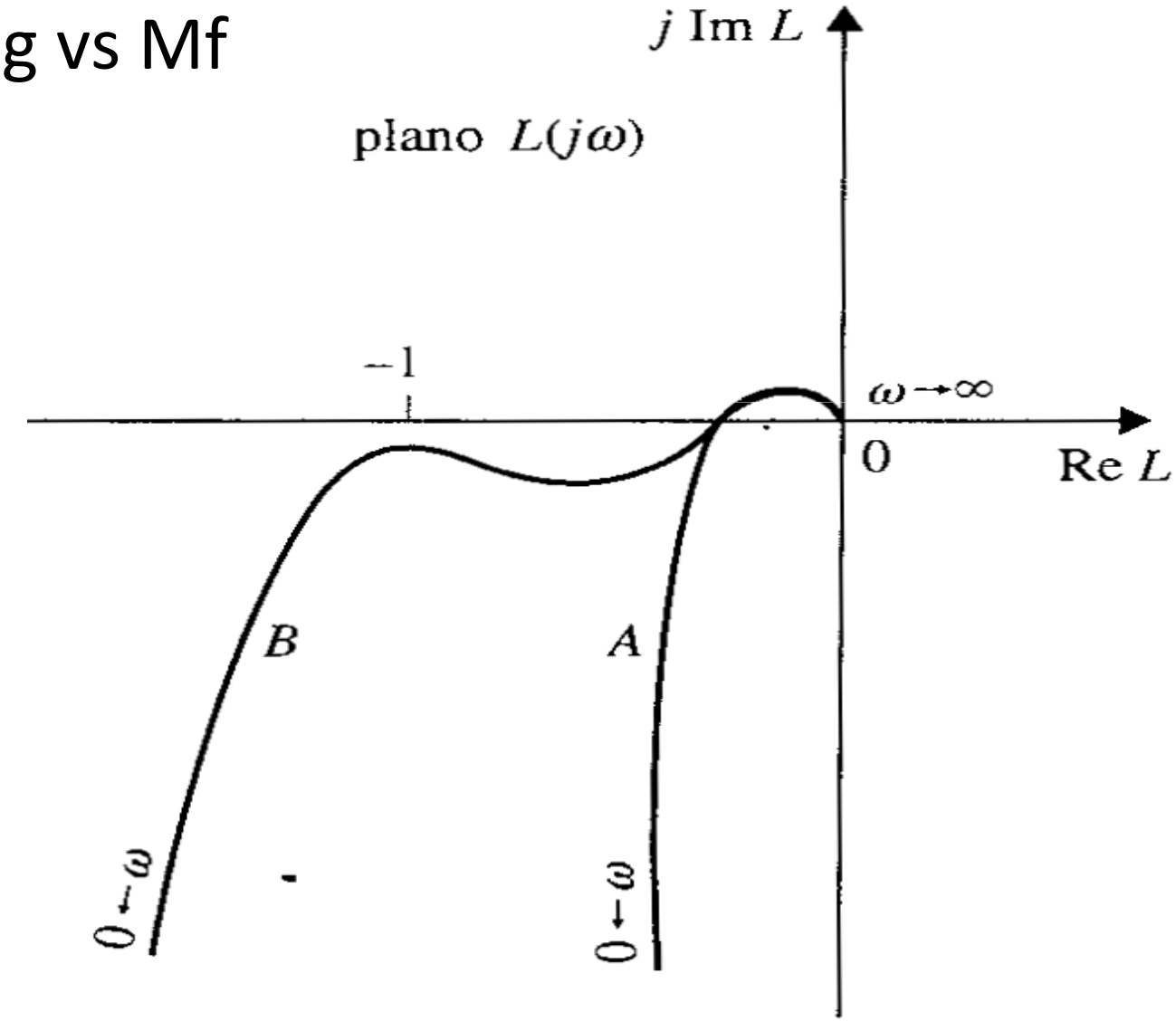


(a) Sistema estable y bien amortiguado

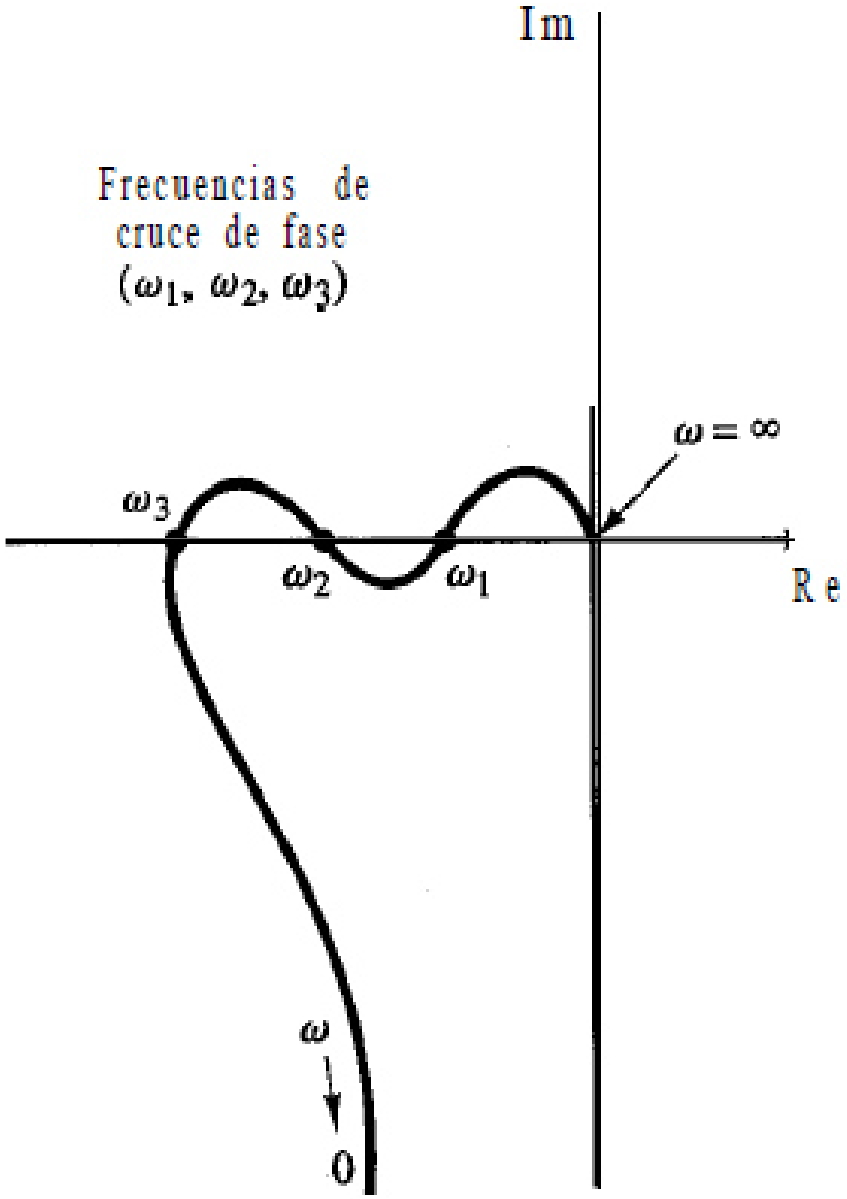


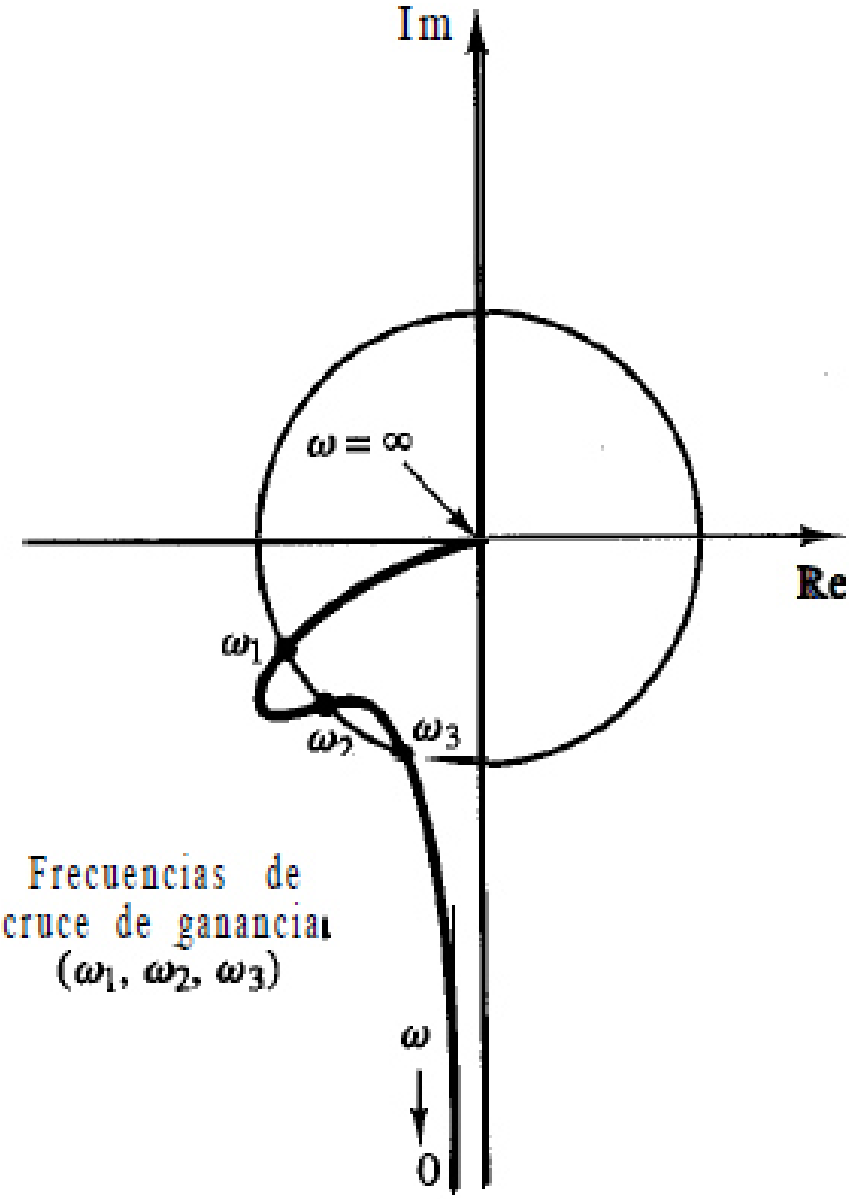
(b) Sistema estable pero oscilatorio

Mg vs Mf



Estabilidad Condicional





Ejemplo de est. condicional

ωc_{0dB} vs AB...