UFPR
UNIVERSIDADE FEDERAL DO PARANÁ

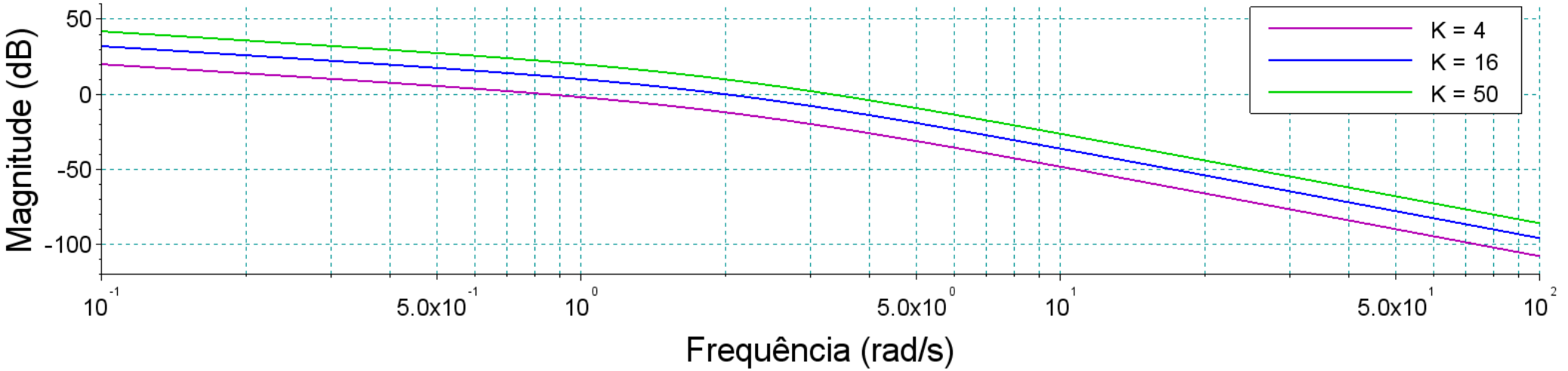
Controle e Servomecanismo

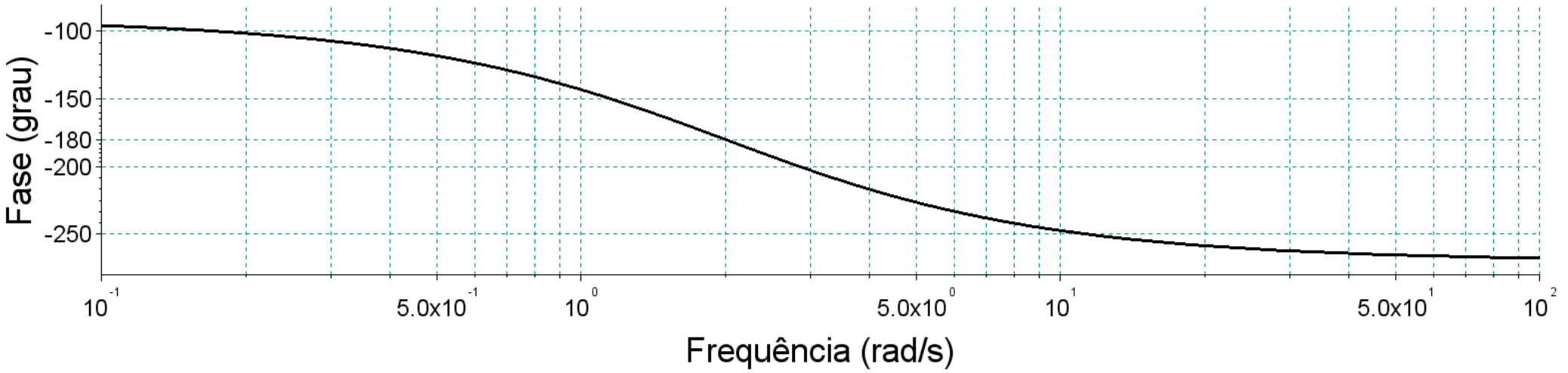
TE240

Margens de estabilidade

Juliana L. M. Iamamura

Exemplo 1: $G(s)=\frac{1}{s(s+2)^2}$





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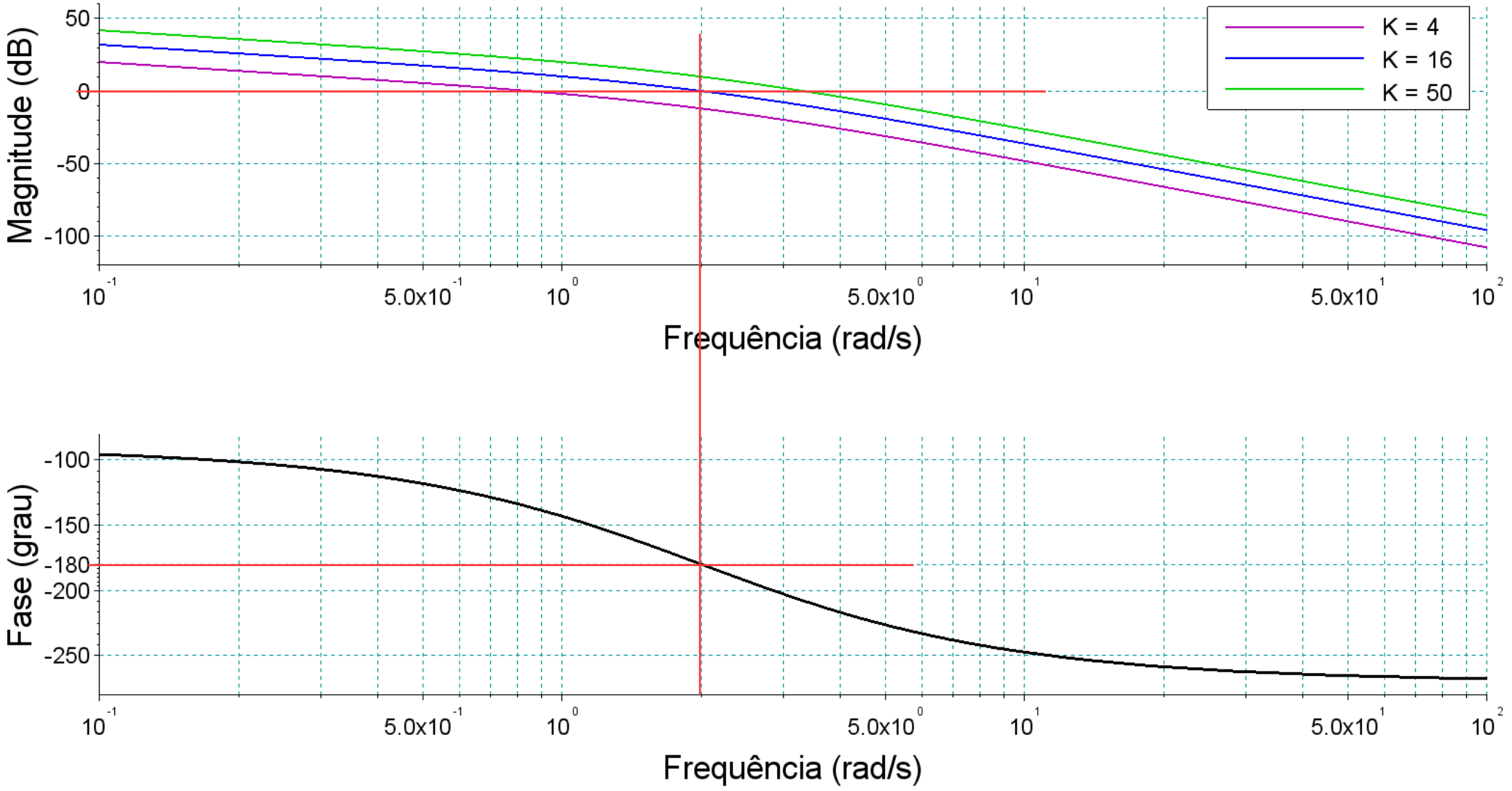

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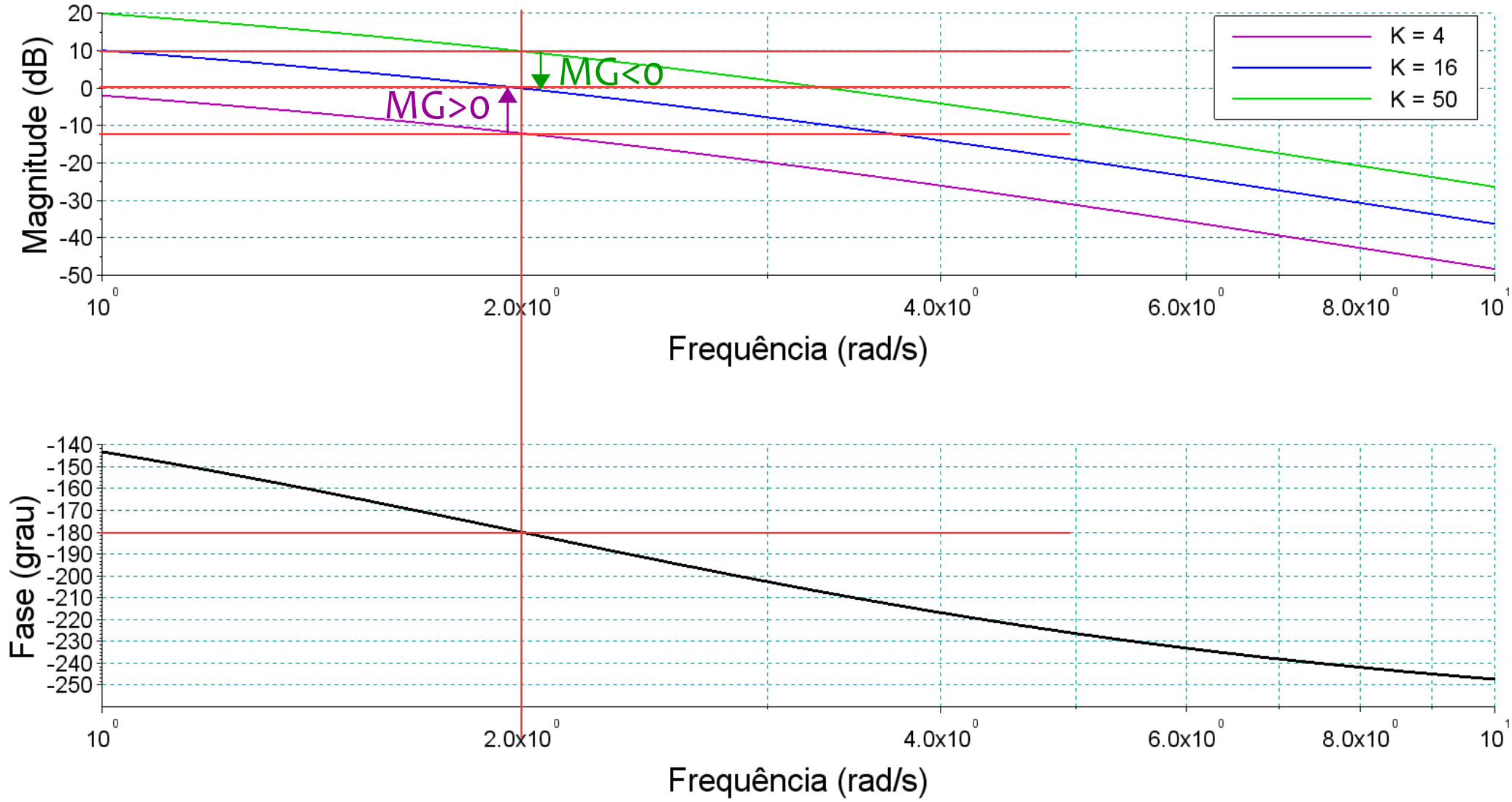
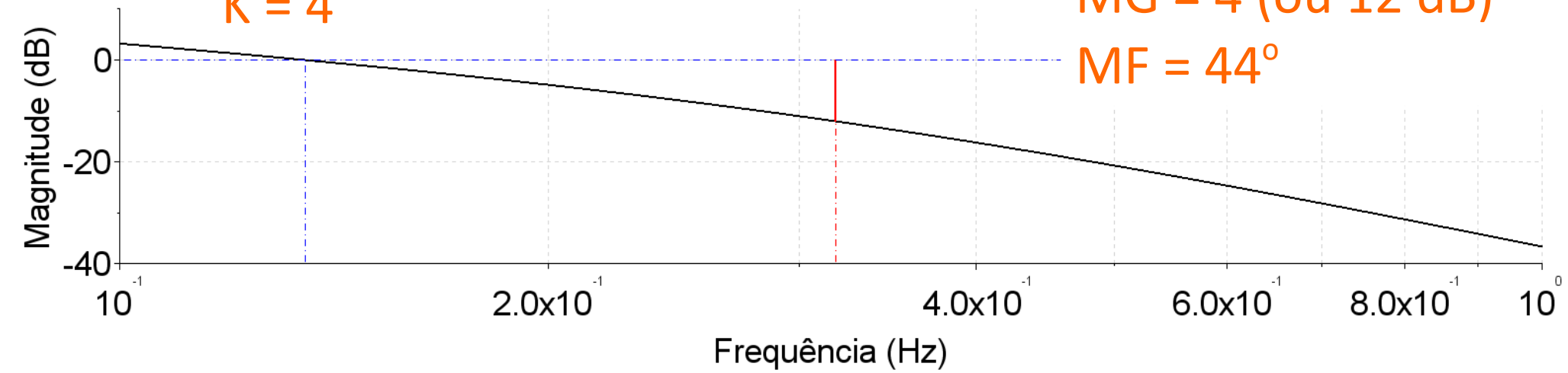


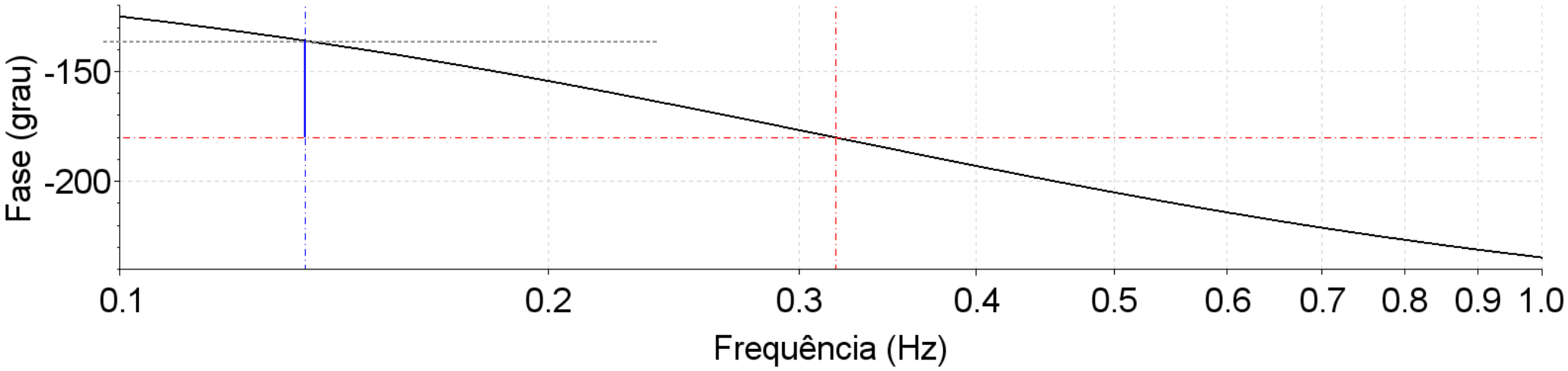
Exemplo 1: $G(s)=\frac{1}{s(s+2)^2}$

K = 4

MG = 4 (ou 12 dB)

MF = 44°



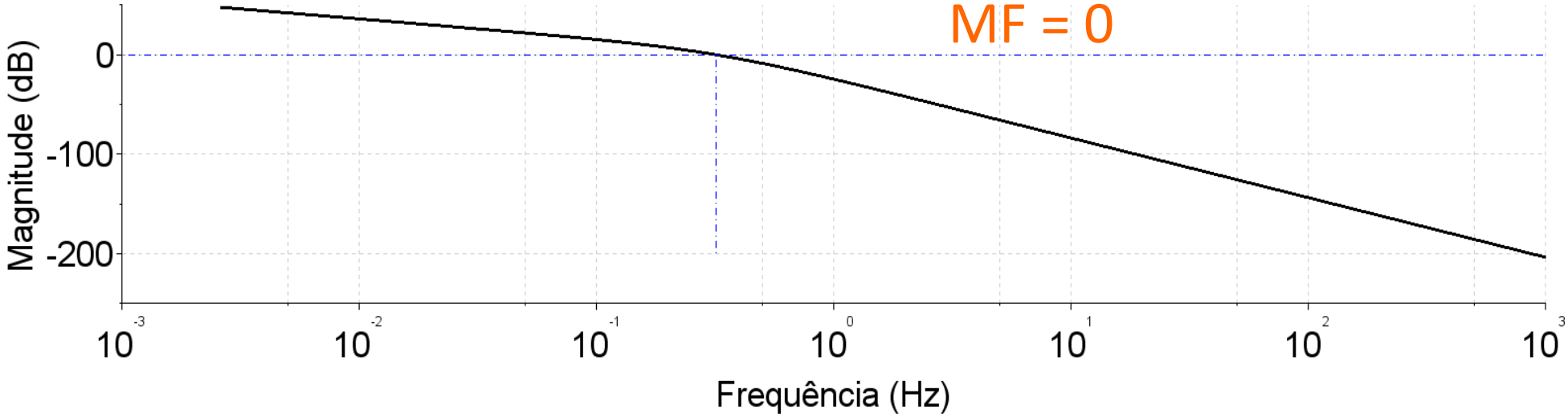


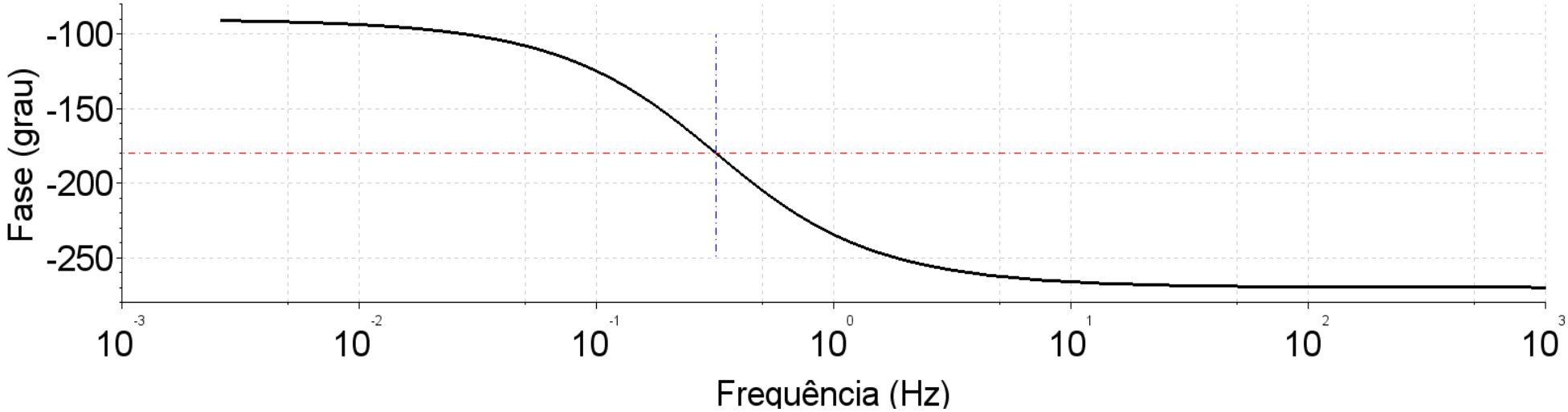
Exemplo 1: $G(s)=\frac{1}{s(s+2)^2}$

K = 16

MG = 1 (ou 0 dB)

MF = 0



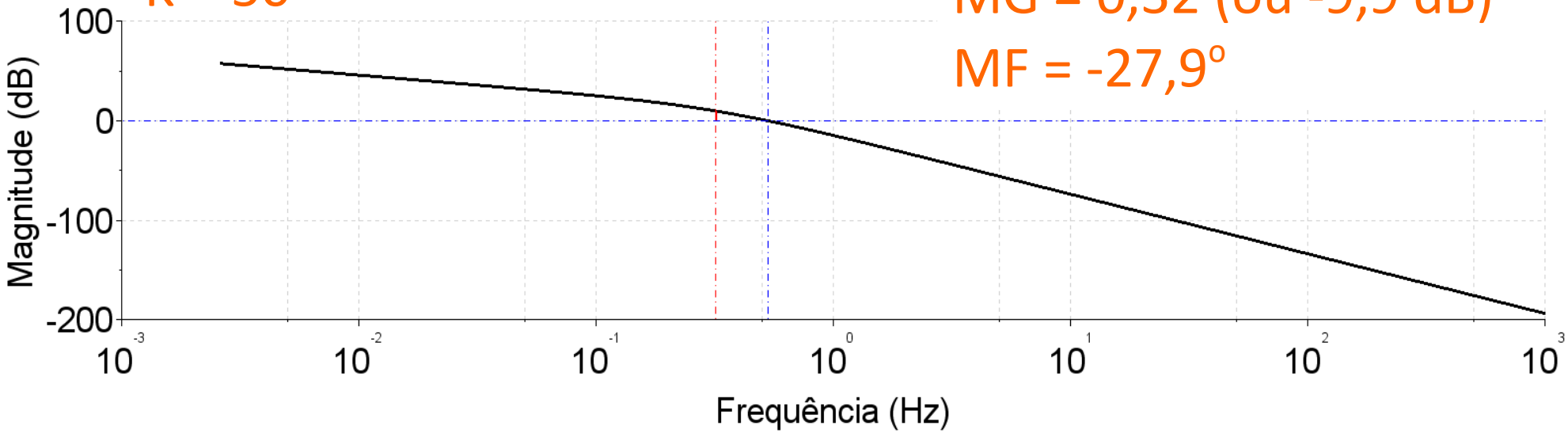


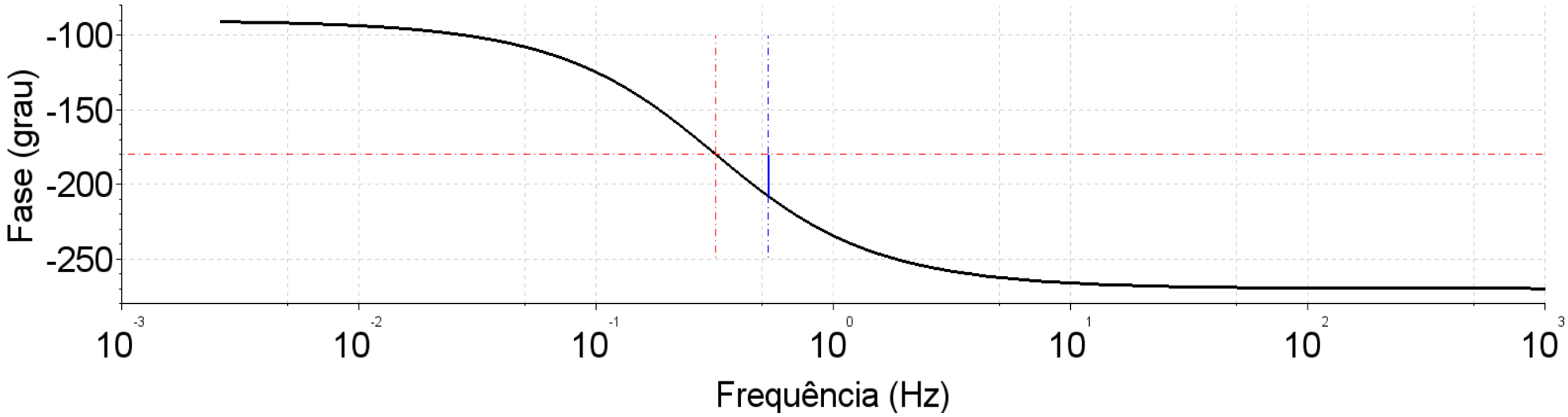
Exemplo 1: $G(s)=\frac{1}{s(s+2)^2}$

K = 50

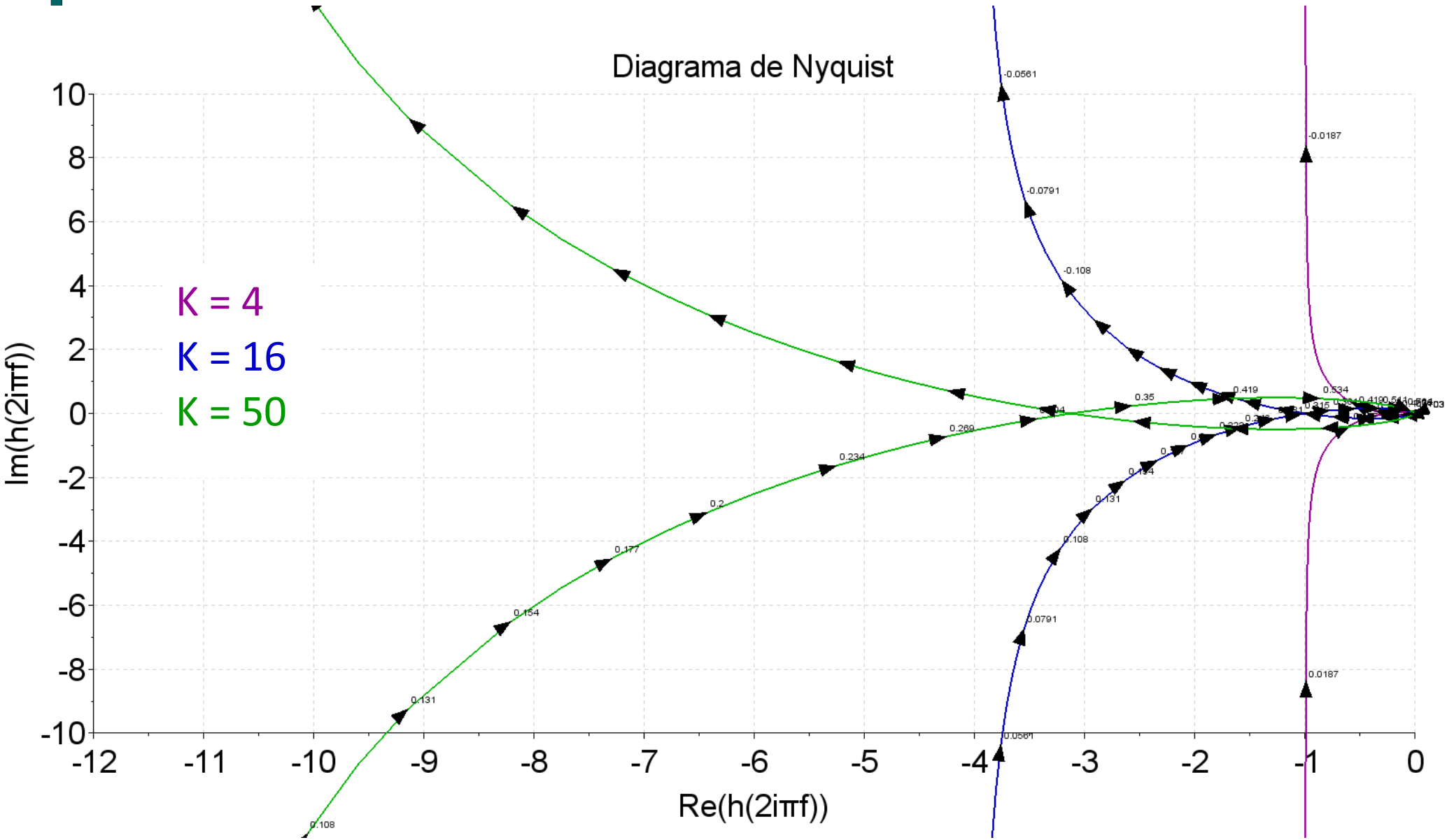
MG = 0,32 (ou -9,9 dB)

MF = -27,9°





Exemplo 1: $G(s)=\frac{1}{s(s+2)^2}$



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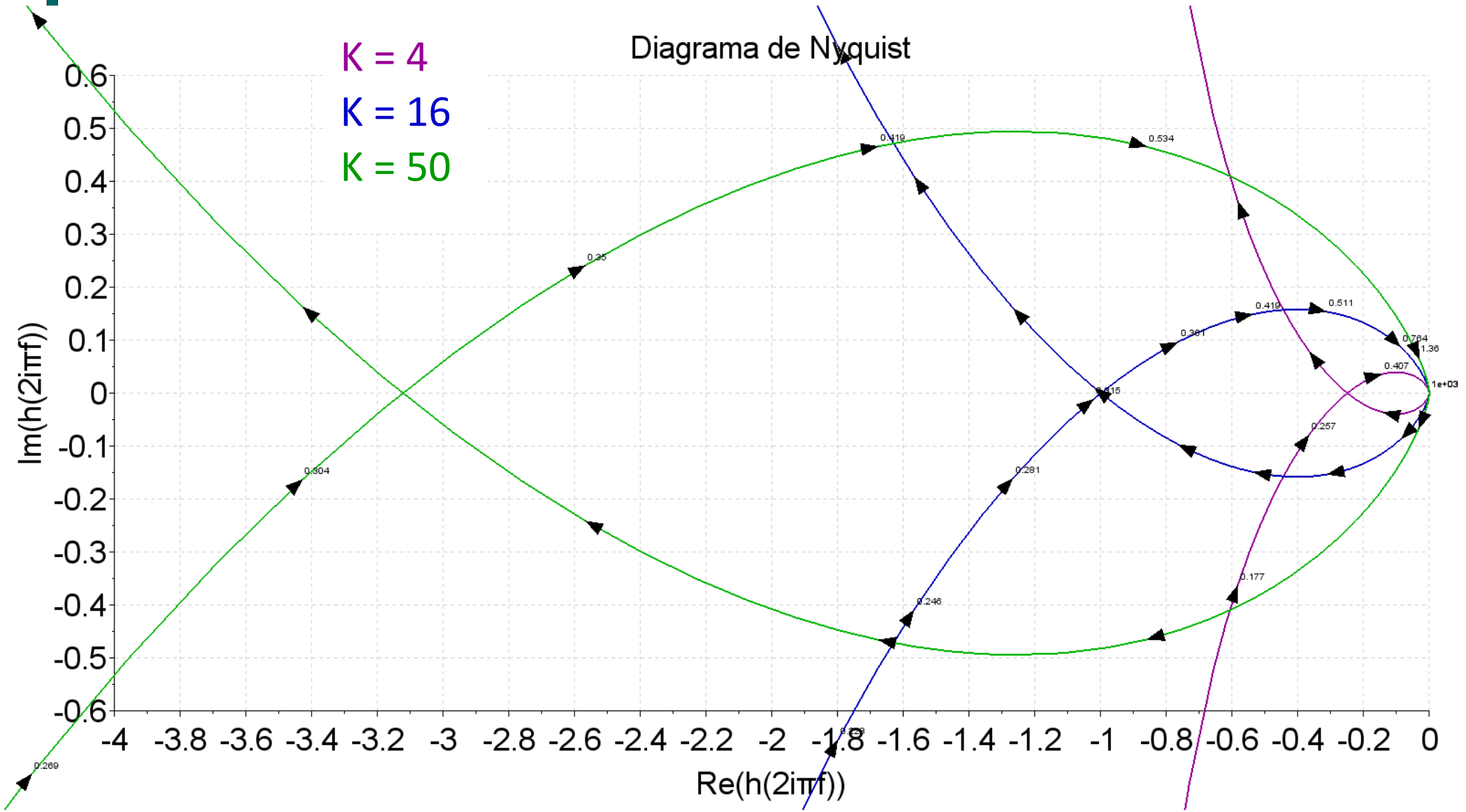

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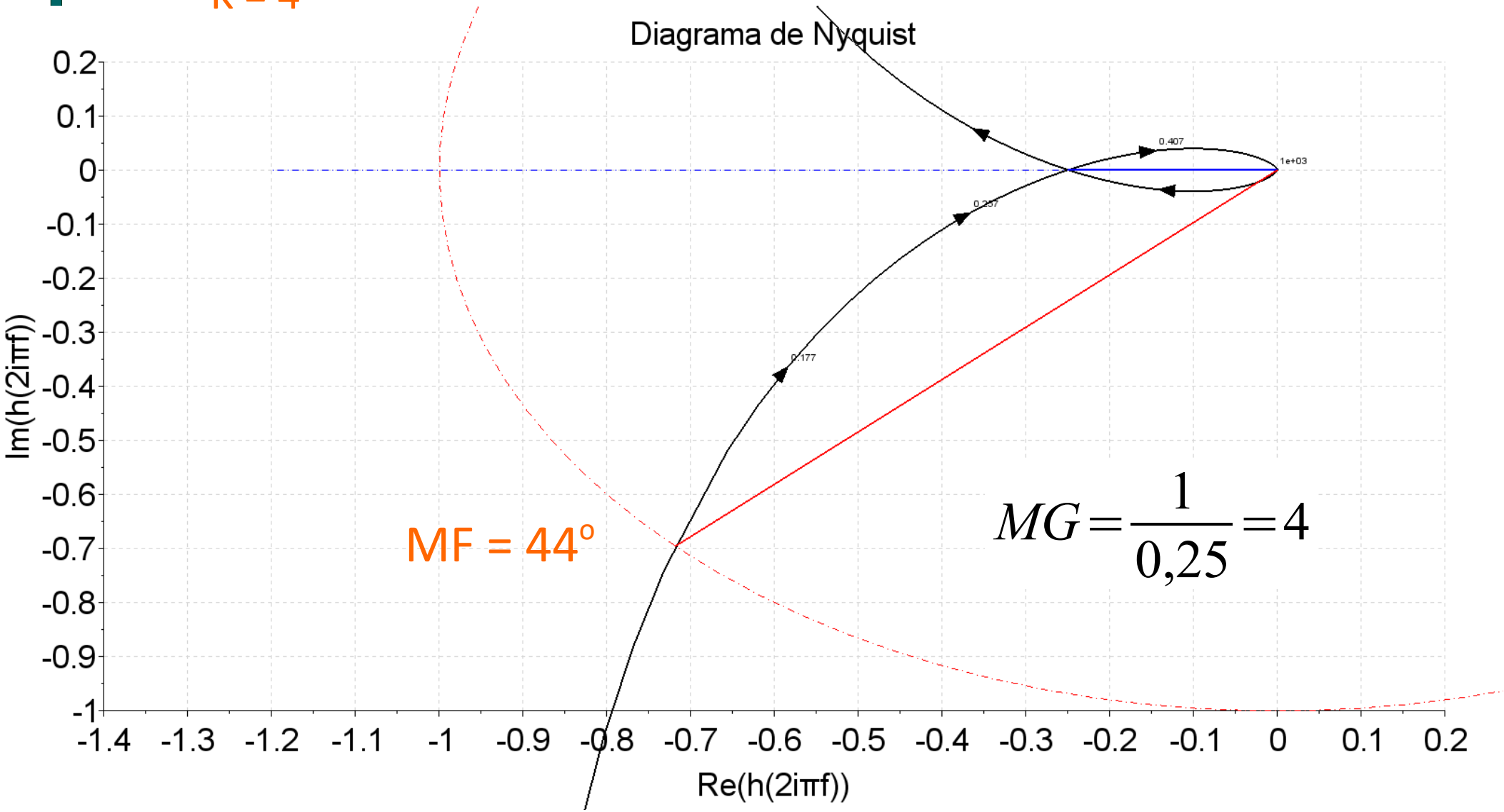
K = 4



MF = 44°

$$MG=\frac{1}{0{,}25}=4$$

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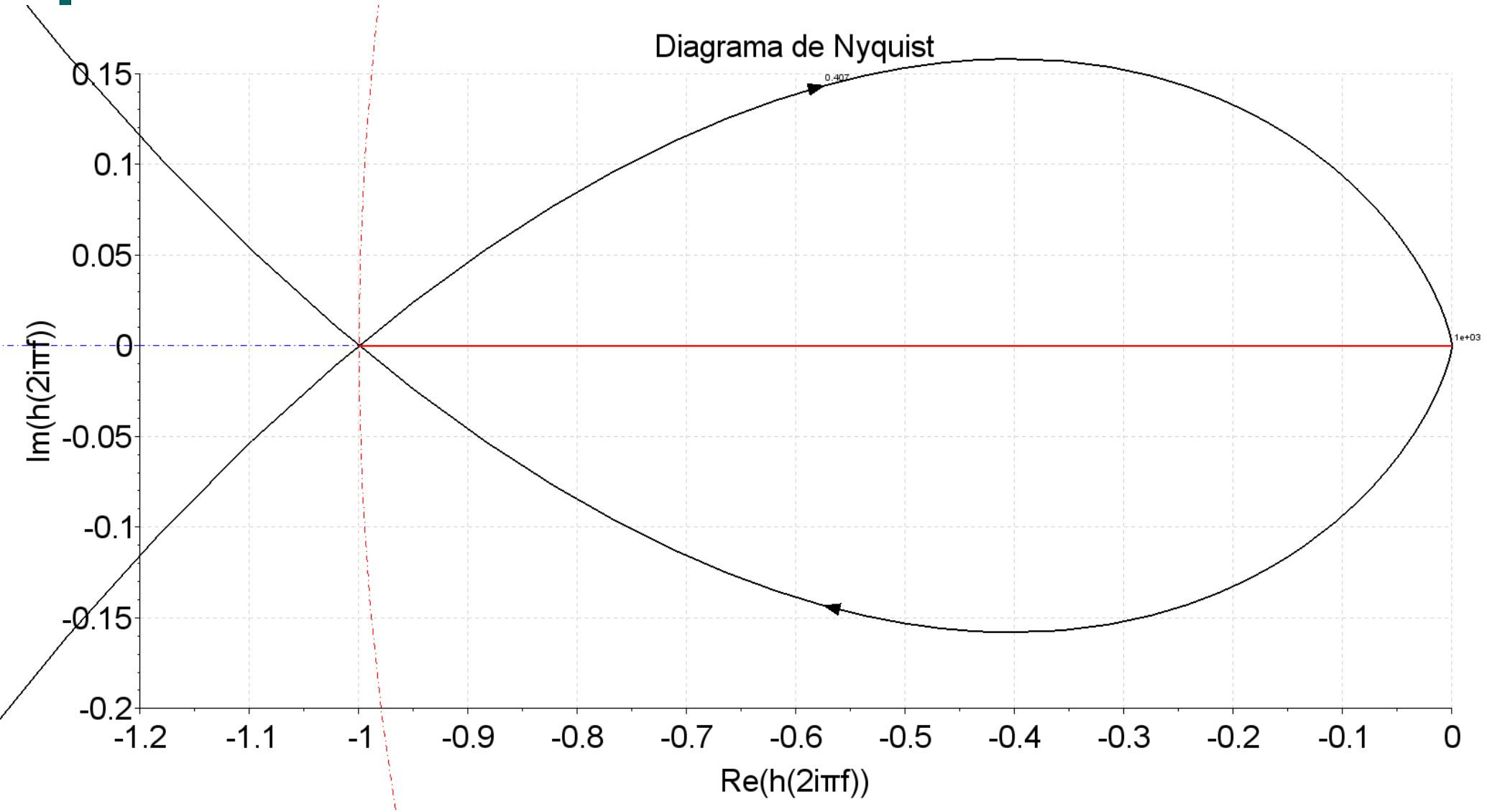
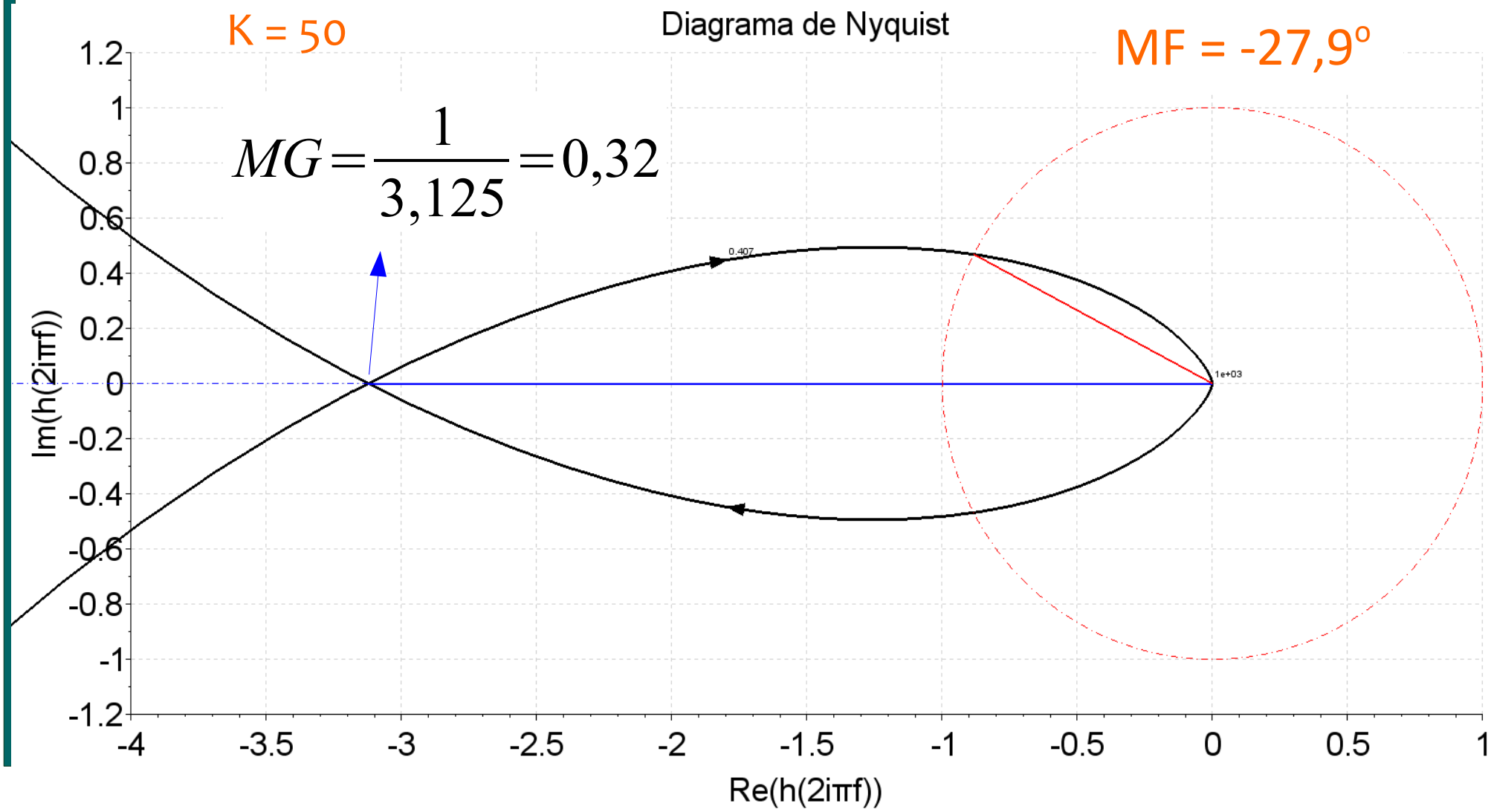
K = 16

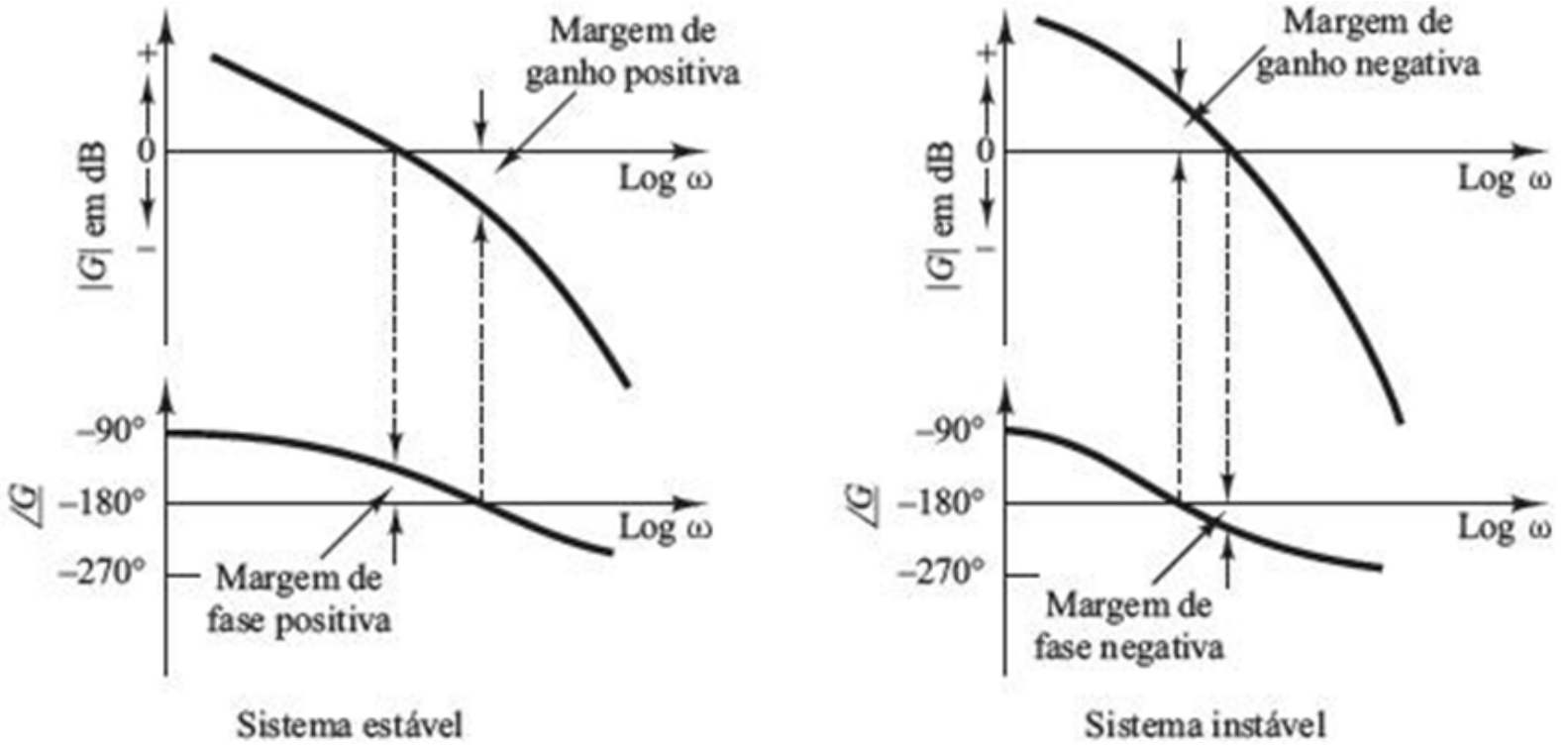


Exemplo 1: $G(s)=\frac{1}{s(s+2)^2}$

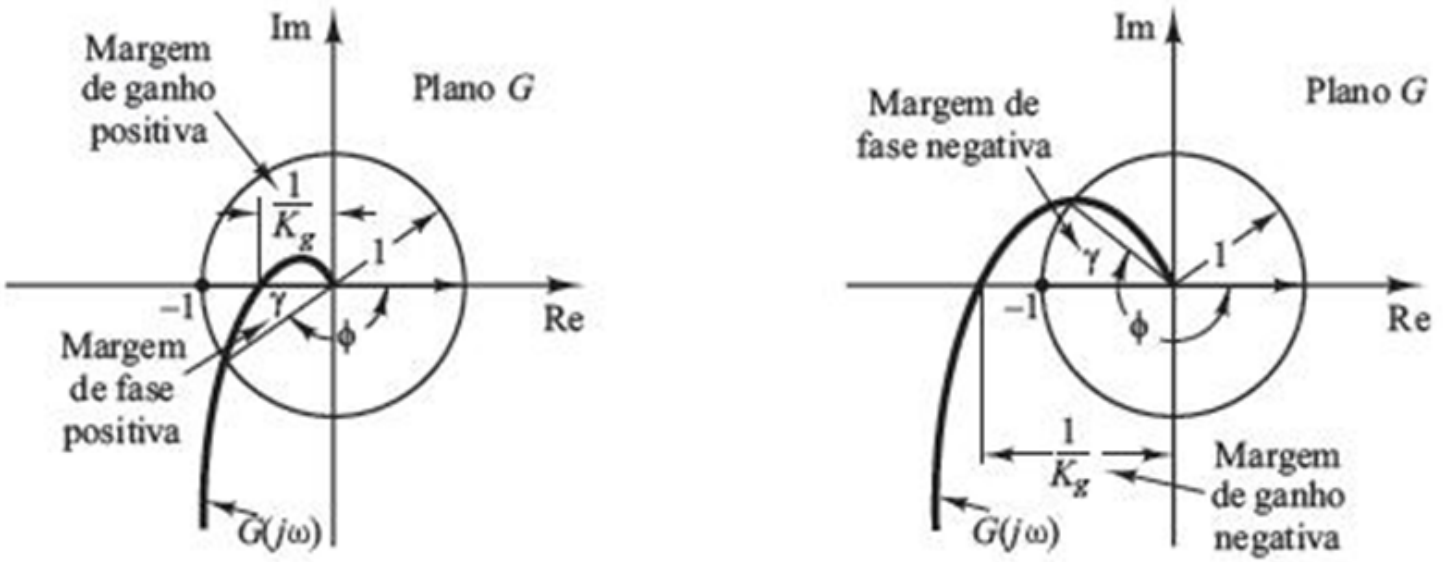
K = 50

$$MG=\frac{1}{3,125}=0,32$$

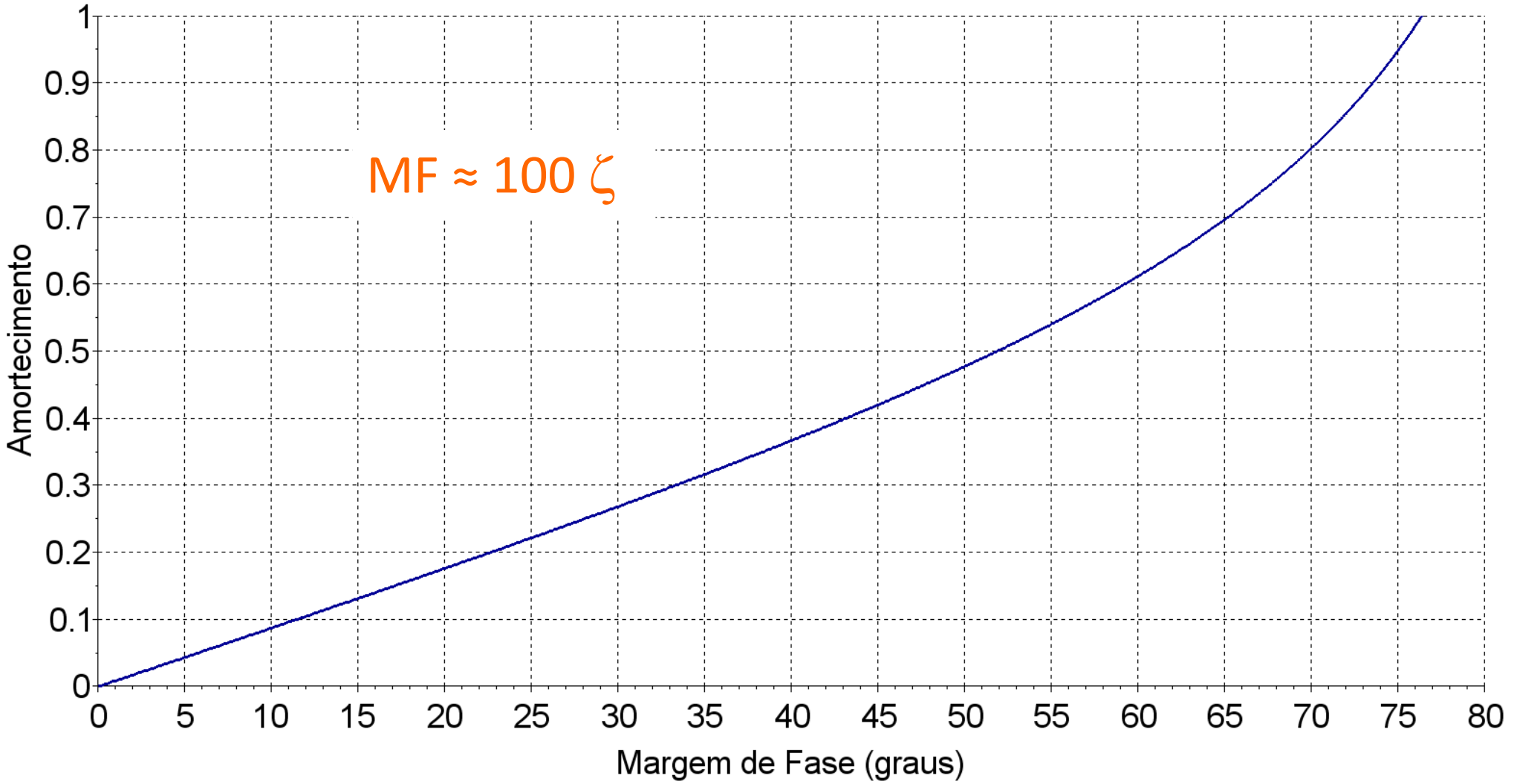



Margem de ganho positiva
+
0
–
|G| em dB
Log ω
–90°
–180°
–270°
∠G
Log ω
Margem de fase positiva
Sistema estável
Margem de ganho negativa
+
0
–
|G| em dB
Log ω
–90°
–180°
–270°
∠G
Log ω
Margem de fase negativa
Sistema instável

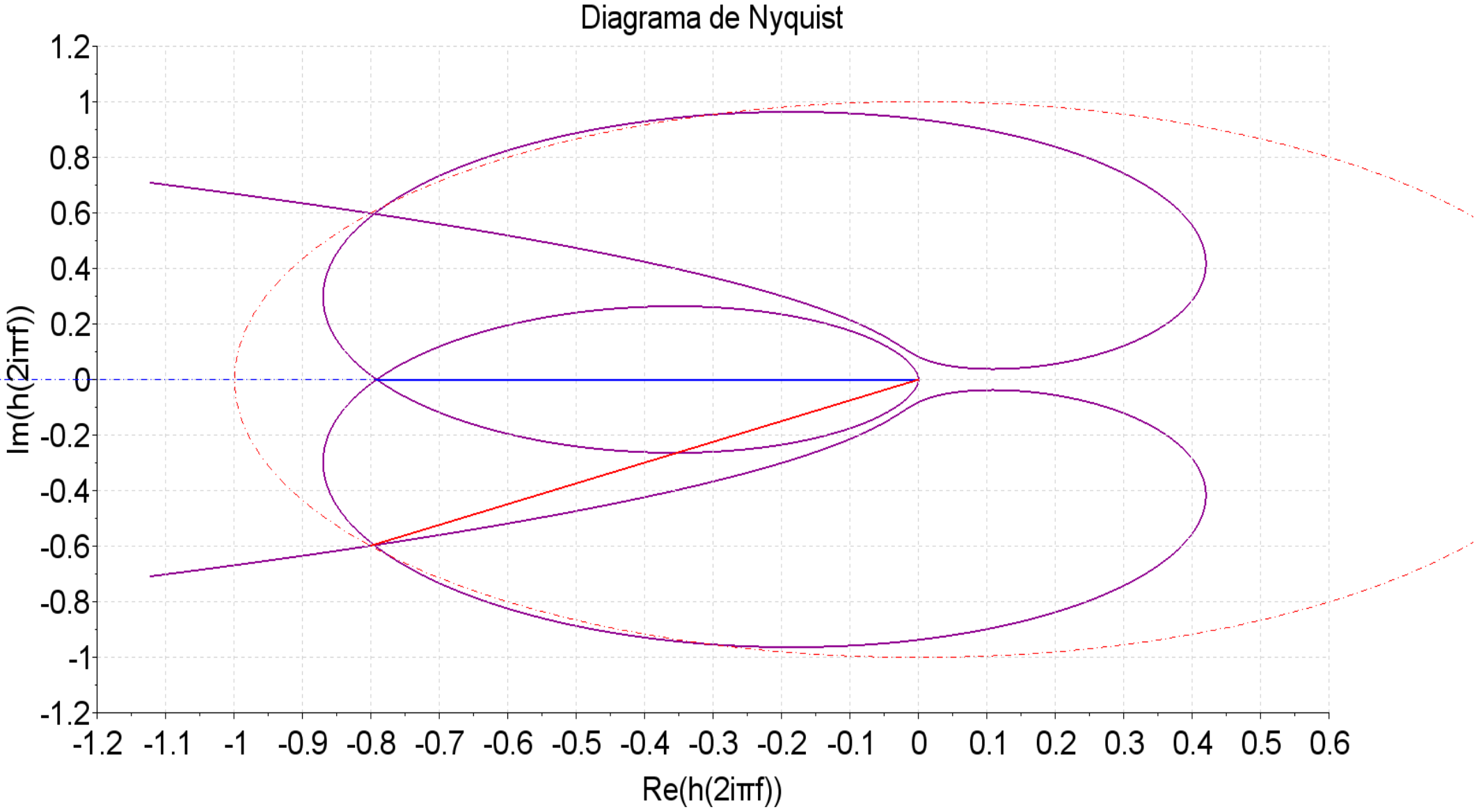
(a)


Im
Margem de ganho positiva
Plano G
1/K_g
1
–1
γ
ϕ
Re
Margem de fase positiva
G(jω)
Sistema estável
Im
Margem de fase negativa
Plano G
γ
1
–1
ϕ
Re
1/K_g
Margem de ganho negativa
G(jω)
Sistema instável

MF e amortecimento



Exemplo: múltiplas frequências de cruzamento



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