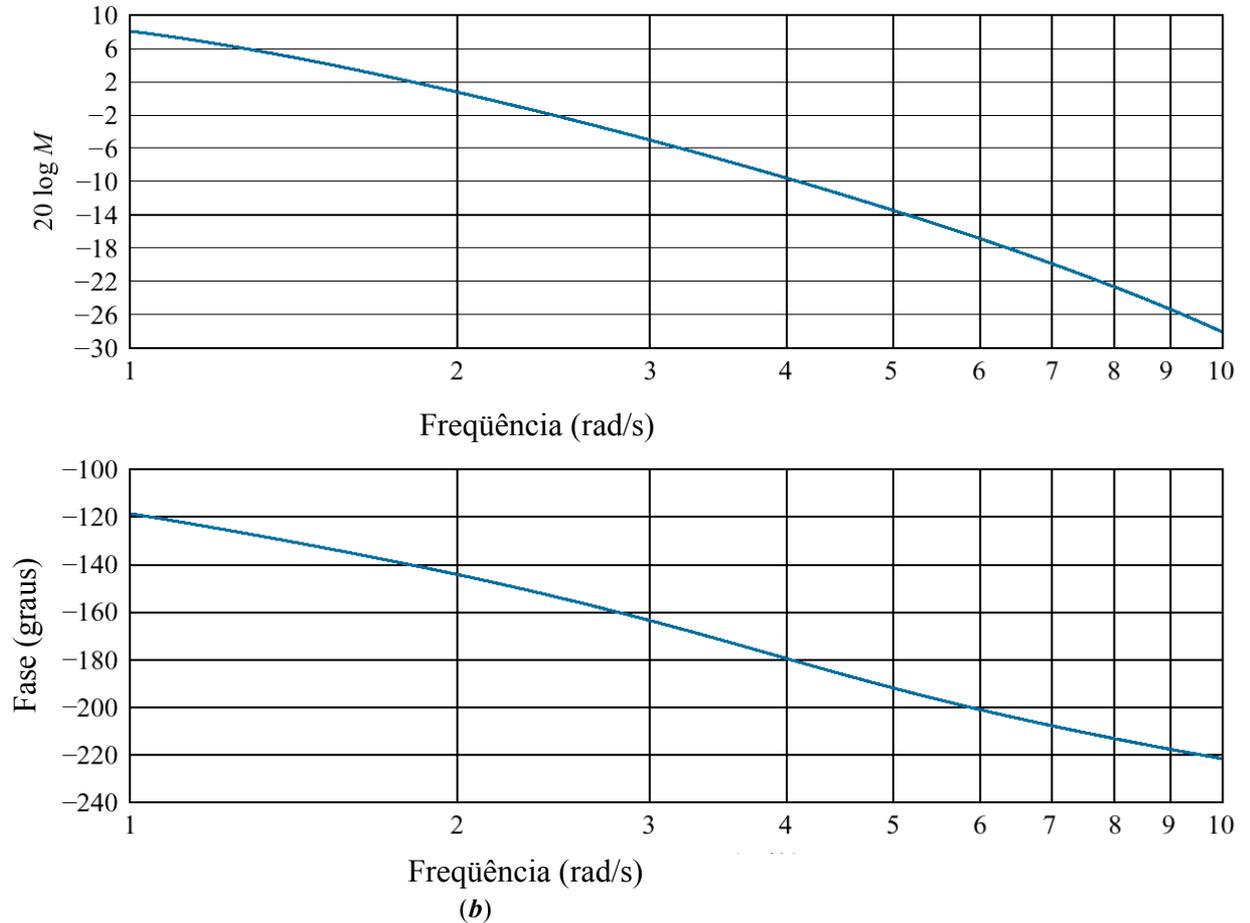


**Fig. 10.50**  
 (continuação)  
**b.** Diagrama de Bode para o sistema do Exemplo 10.13



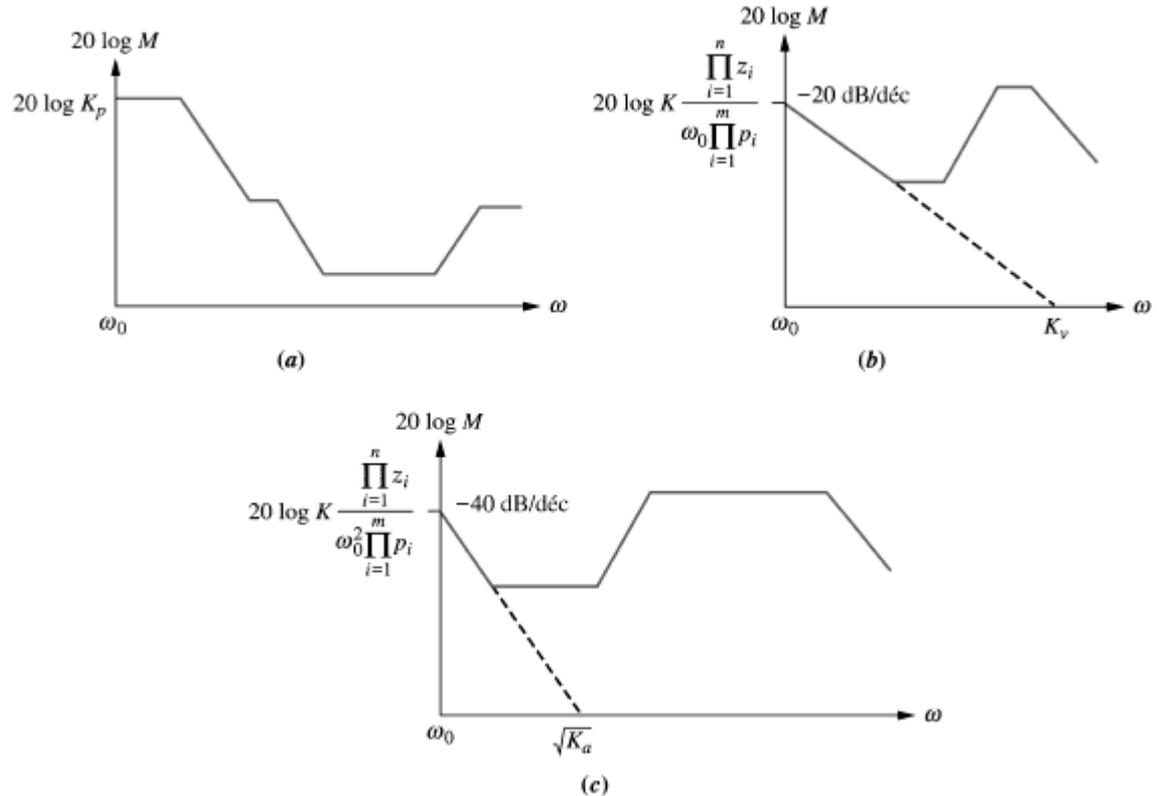
# Fig. 10.51

## Gráficos

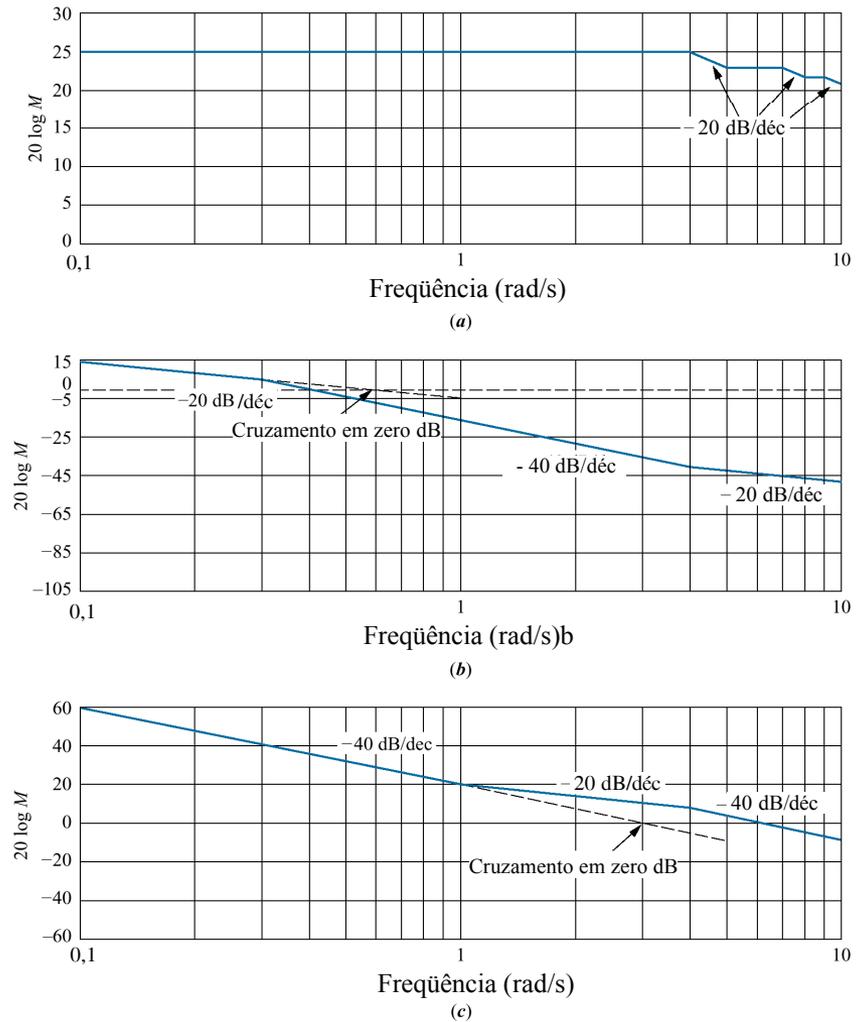
logarítmicos de magnitude de Bode típicos não normalizados e sem escala

mostrando o valor das constantes de erro estático:

- a. Tipo 0;
- b. Tipo 1;
- c. Tipo 2

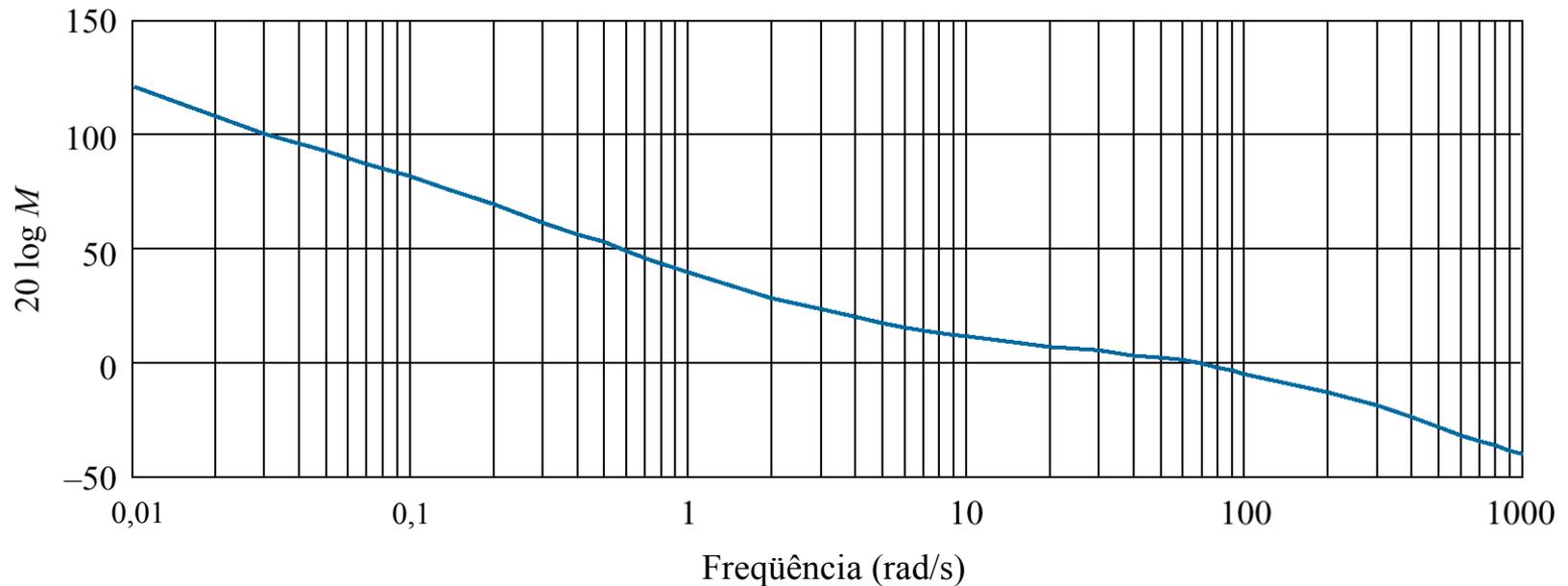


**Fig. 10.52**  
Gráfico de magnitude logarítmica de Bode para o Exemplo 10.14

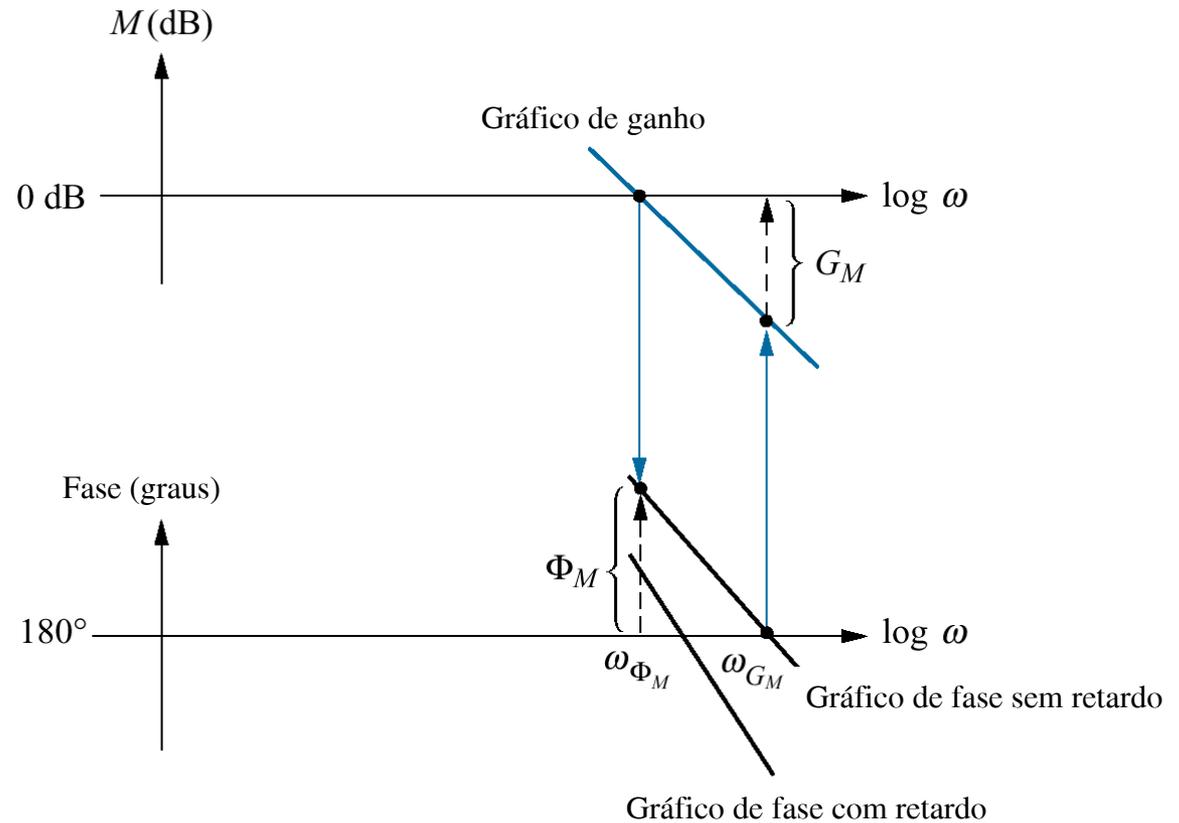


## Fig. 10.53

Gráfico de magnitude logarítmica de Bode para o Exercício de Avaliação 10.10

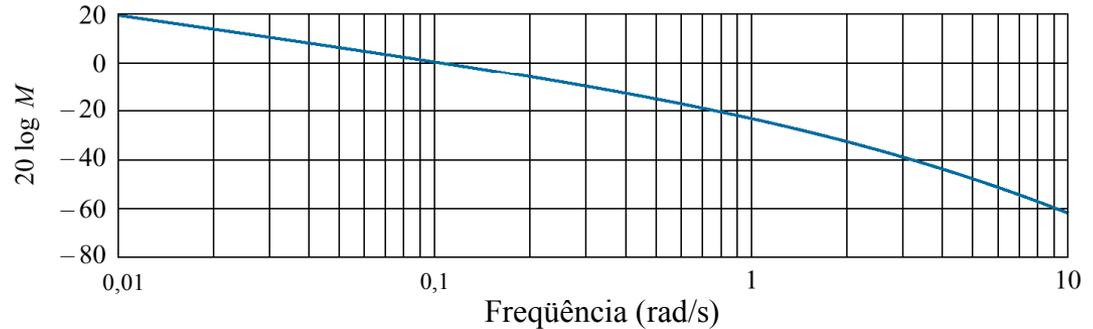


**Fig. 10.54**  
 O efeito do retardo na resposta de frequência

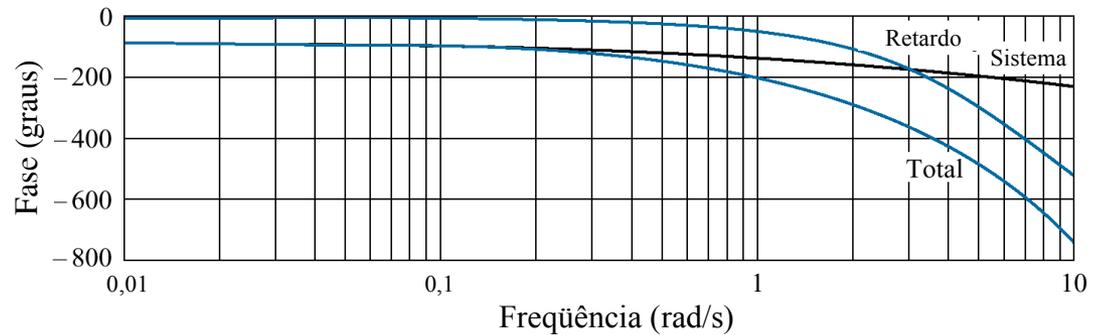


# Fig. 10.55

Diagrama de resposta de frequência para  $G(s) = K[s(s+1)(s+10)]$  com um retardo de 1 s e  $K = 1$ ;  
**a.** diagrama de magnitude;  
**b.** diagrama de fase



(a)



(b)

# Fig. 10.56

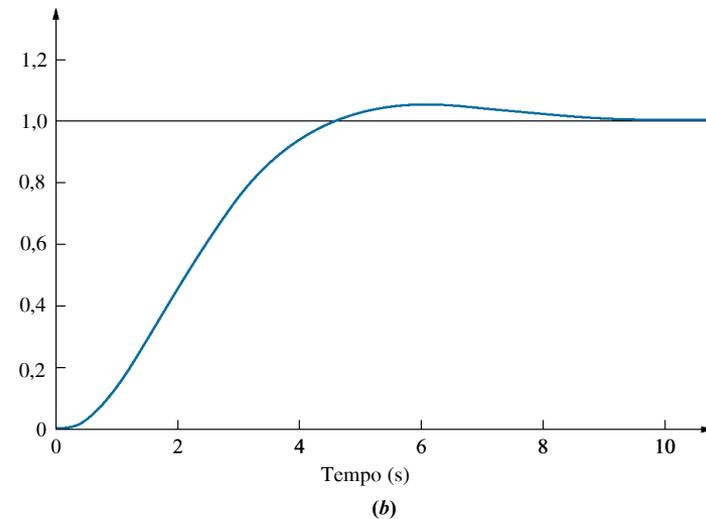
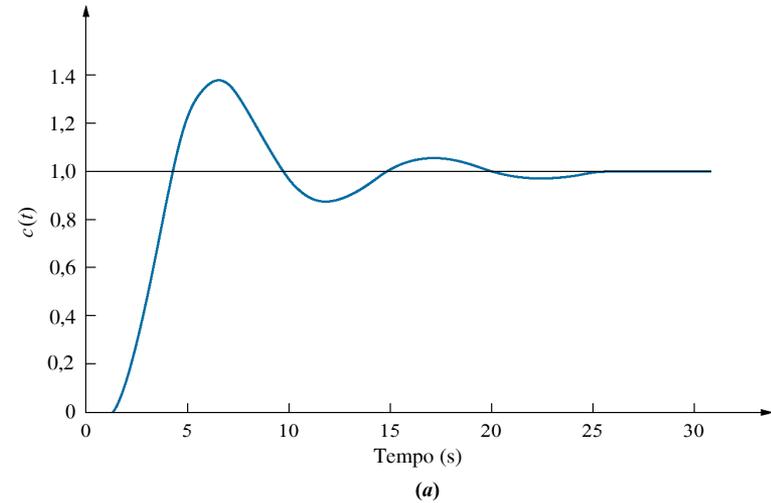
Resposta ao degrau para sistema a malha fechada com

$$G(s) =$$

$$5/[s(s + 1)(s + 10)]:$$

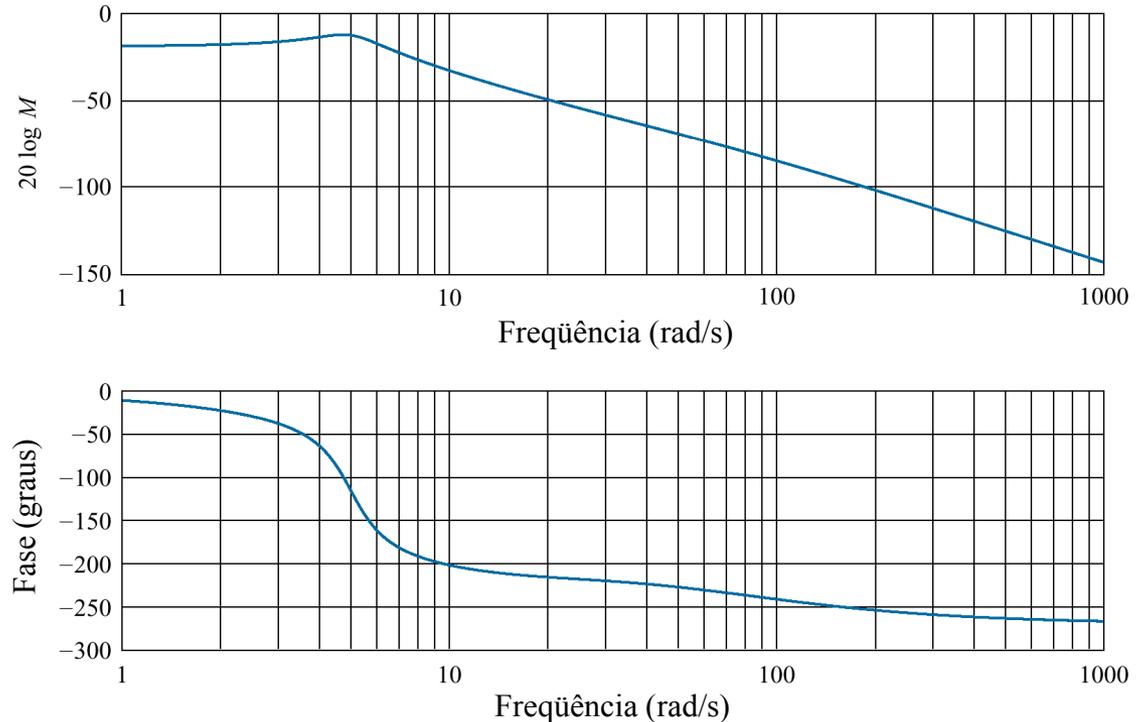
**a.** com retardo de 1 s;

**b.** sem retardo



# Fig. 10.57

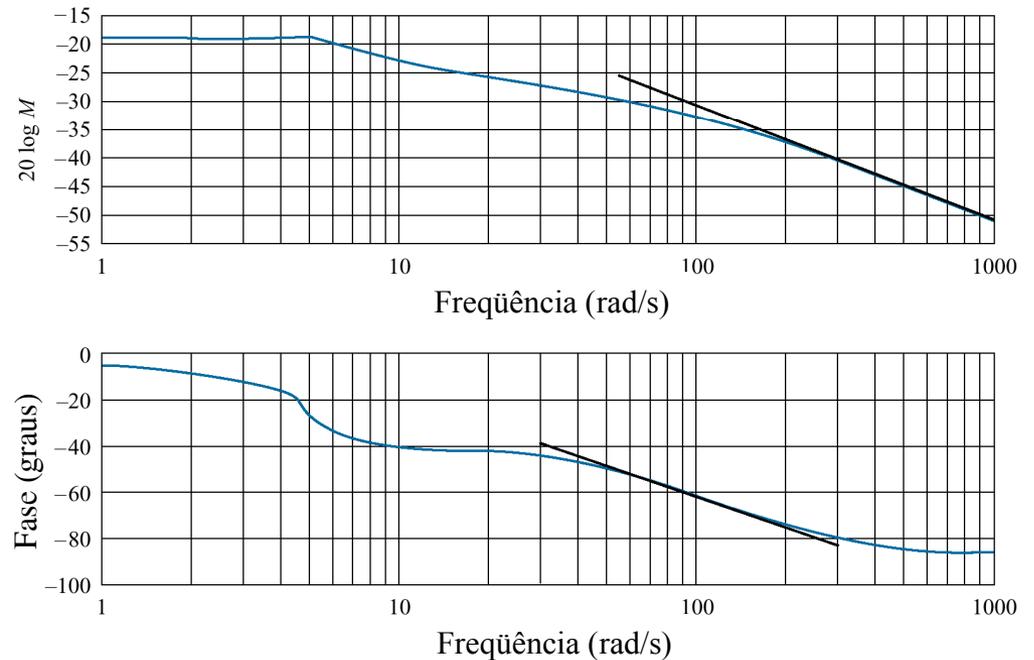
Diagramas de Bode para subsistema com função de transferência não determinada



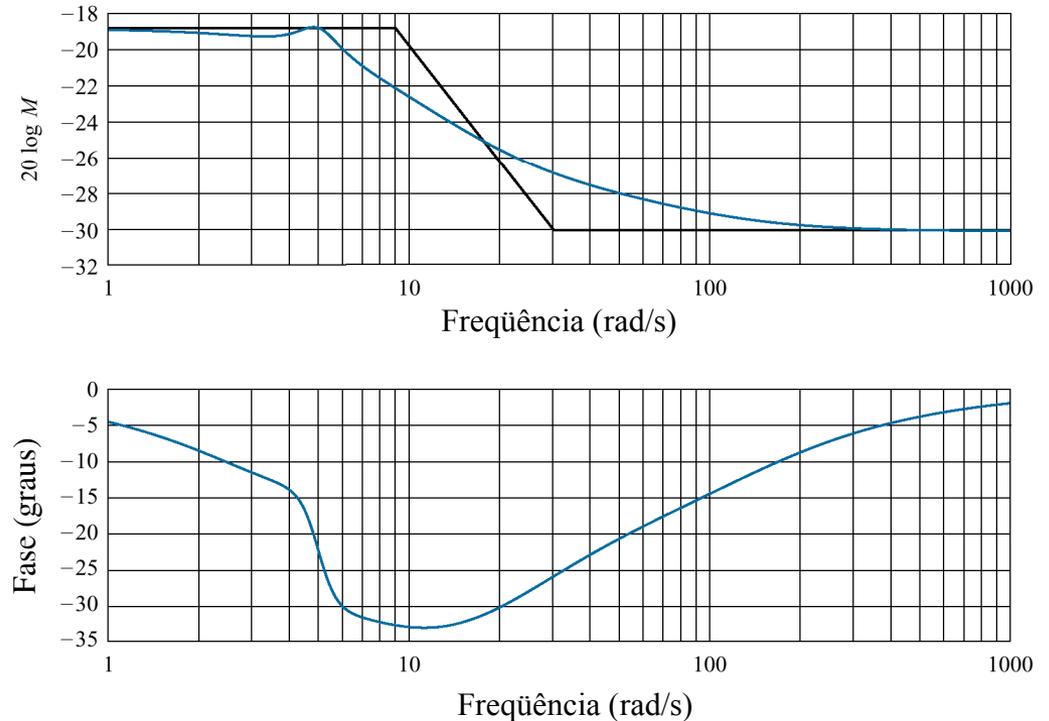
# Fig. 10.58

Diagramas de Bode  
originais menos  
resposta de

$$G_1(s) = \frac{25}{(s^2 + 2,4s + 25)}$$

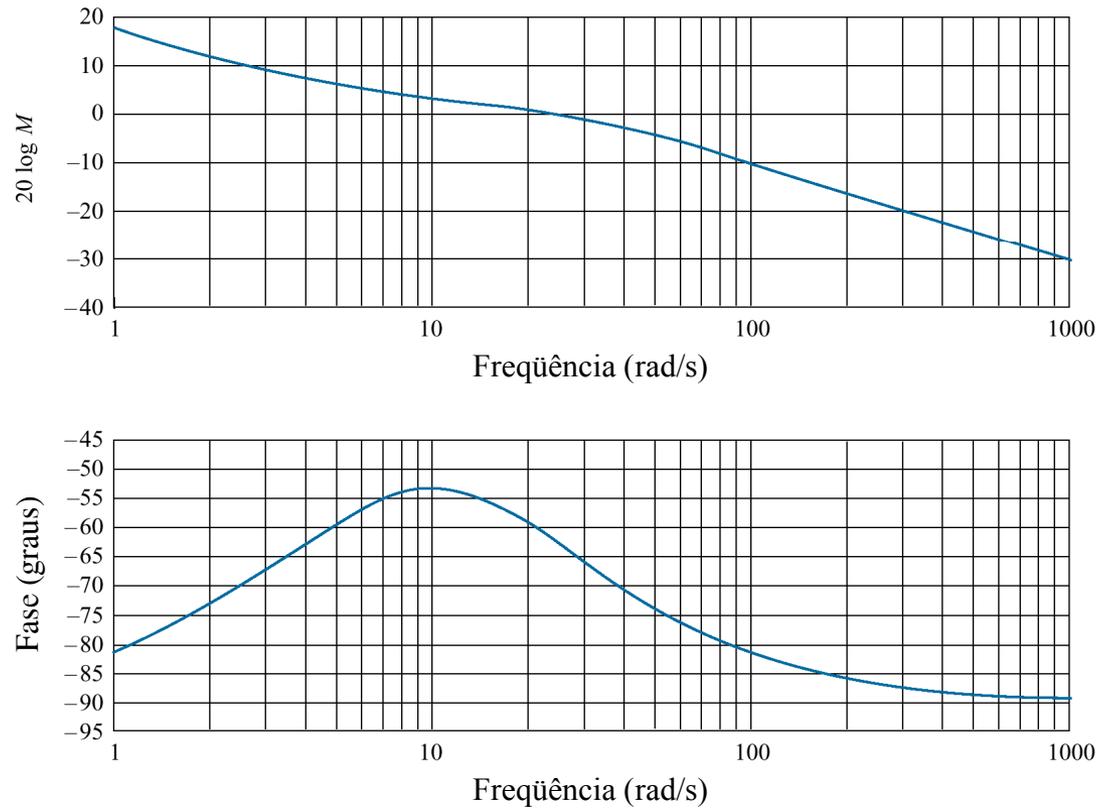


**Fig. 10.59**  
 Diagramas de Bode  
 originais menos  
 resposta de  
 $G_1(s)G_2(s) =$   
 $[25/(s^2 + 2,4s + 25)]$   
 $\cdot [90/(s + 90)]$



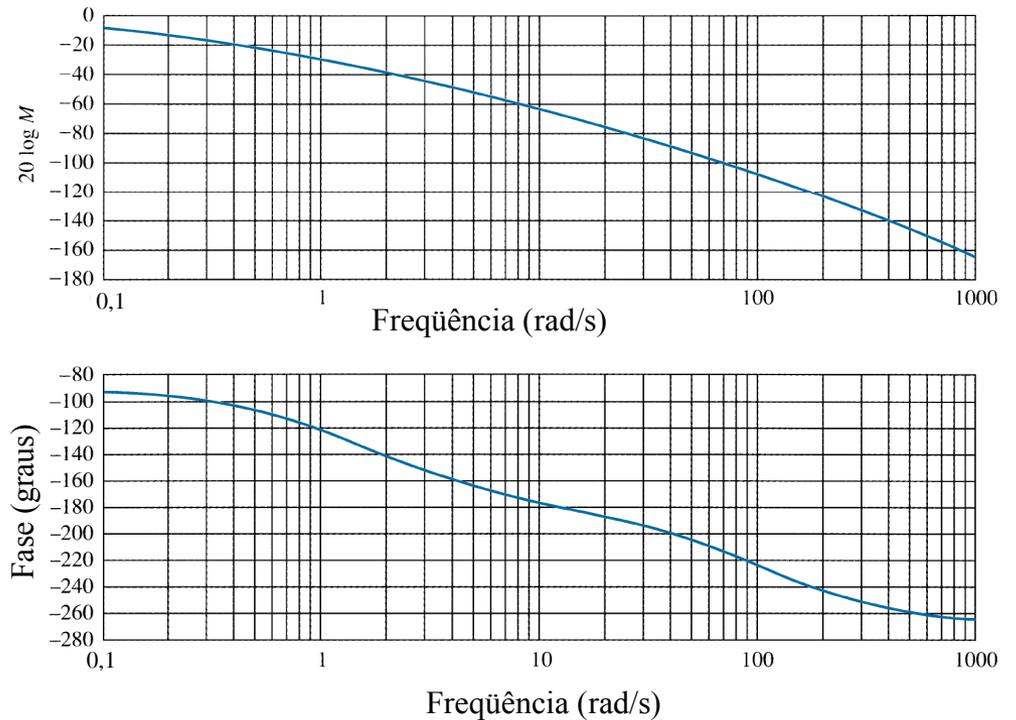
# Fig. 10.60

## Diagramas de Bode para o Exercício de Avaliação 10.12.

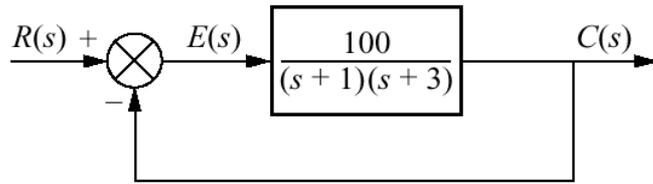


# Fig. 10.61

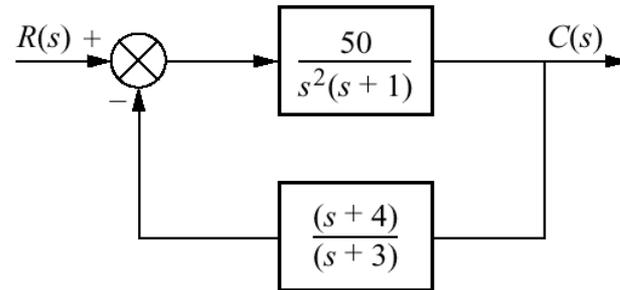
Diagramas de resposta de frequência a malha fechada para o sistema de controle de antena ( $K = 1$ )



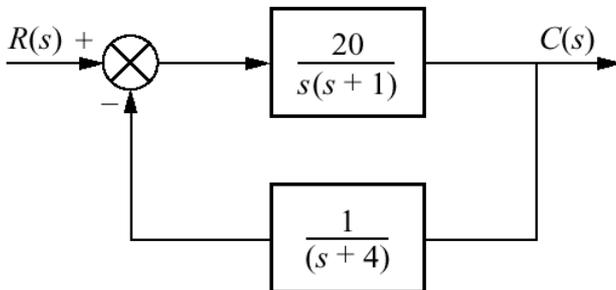
# Fig. P10.1



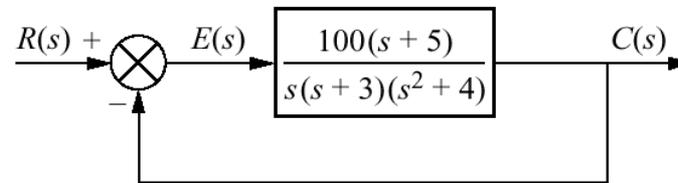
Sistema 1



Sistema 2

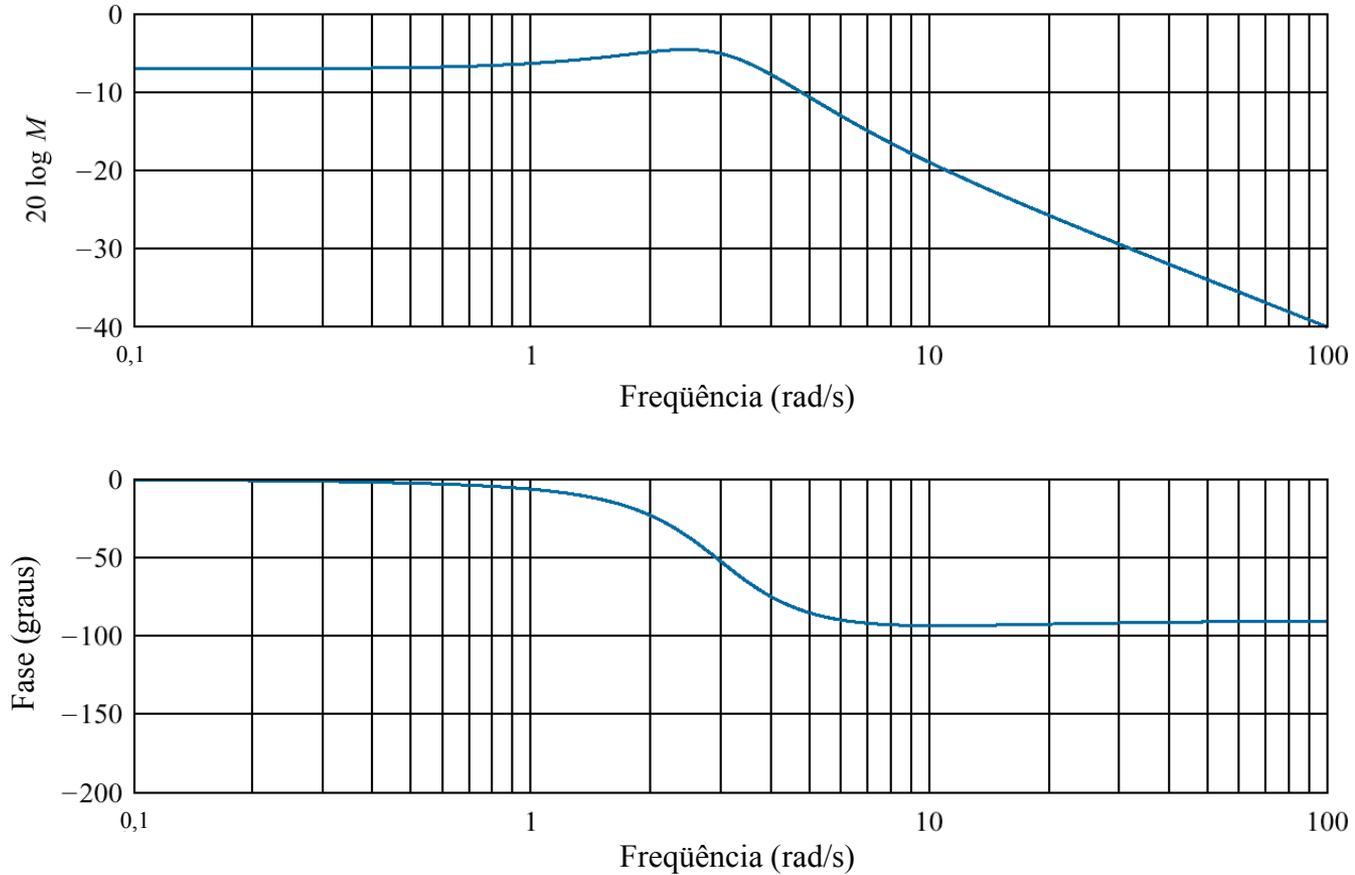


Sistema 3

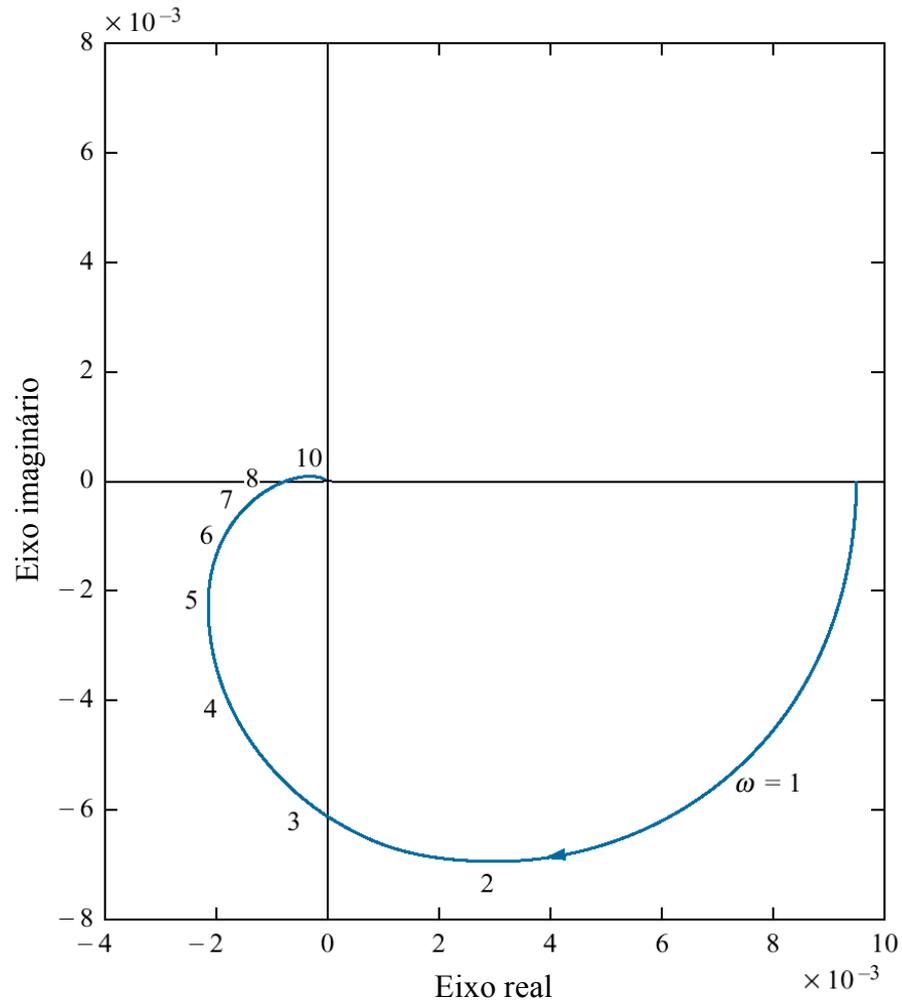


Sistema 4

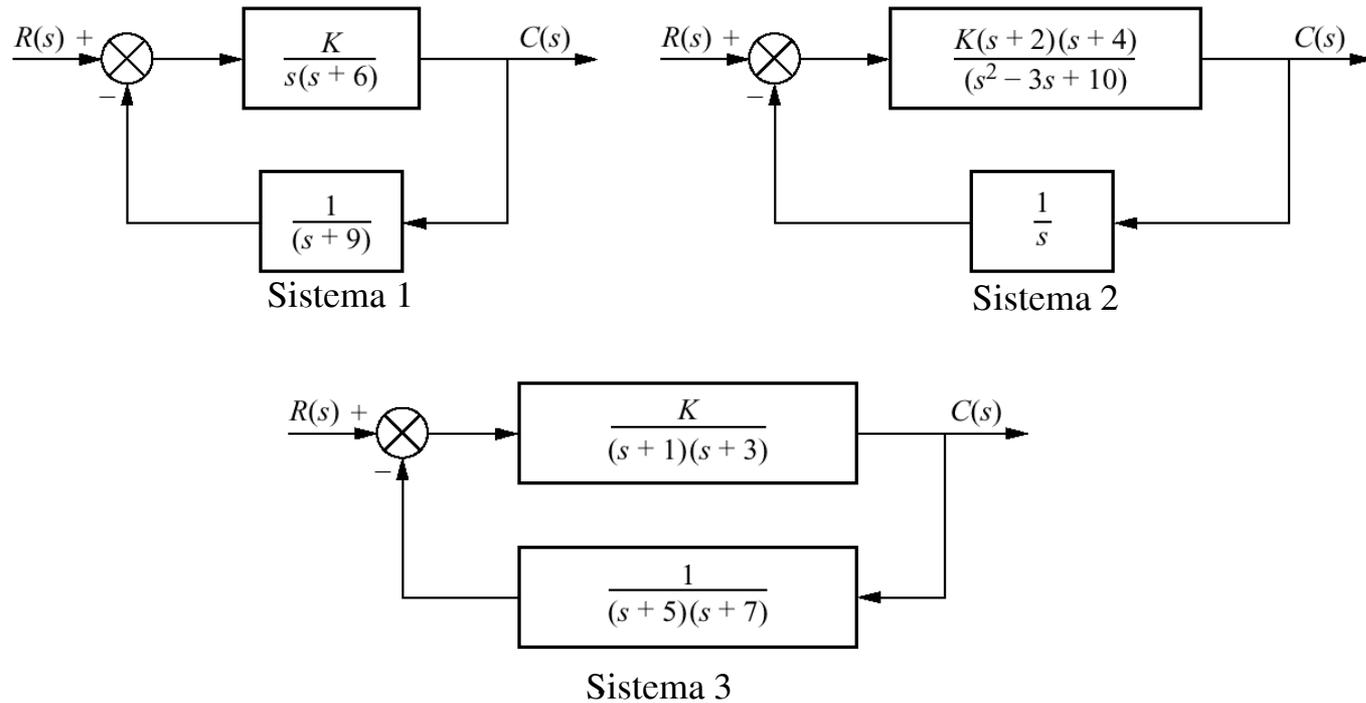
# Fig. P10.2

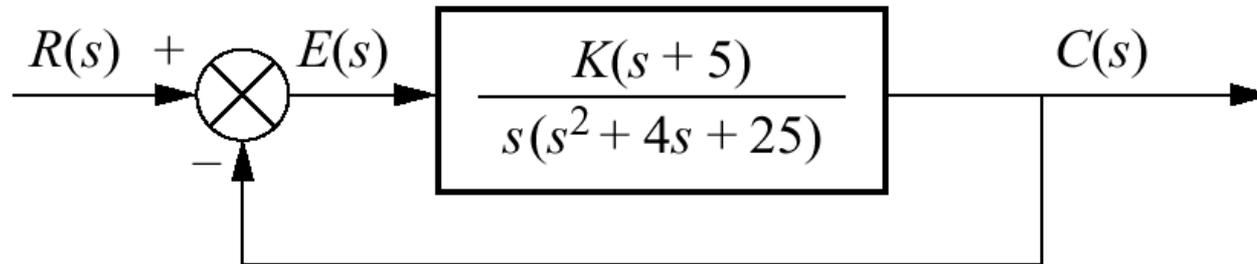


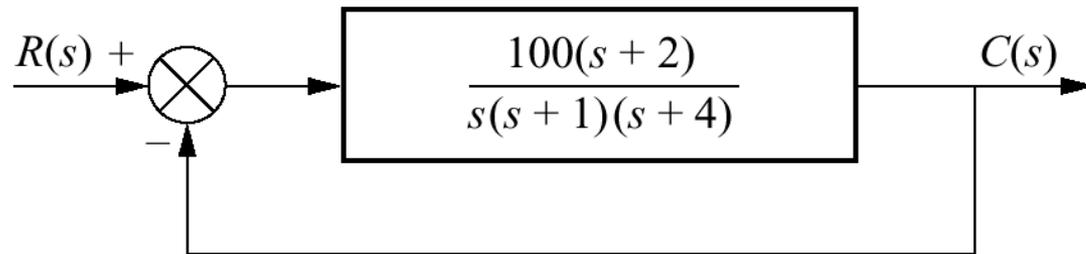
**Fig. P10.3**



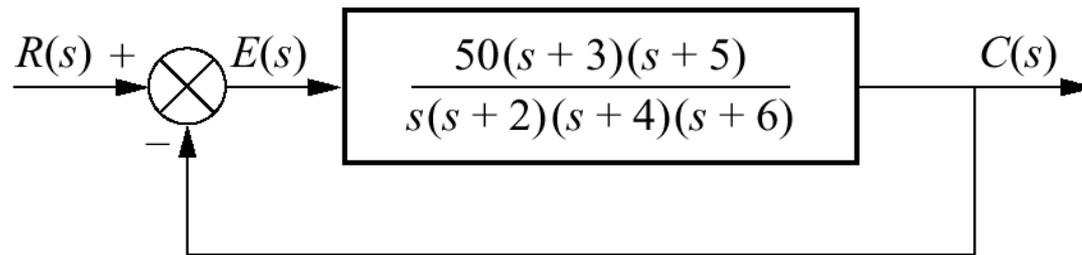
# Fig. P10.4



**Fig. P10.5**

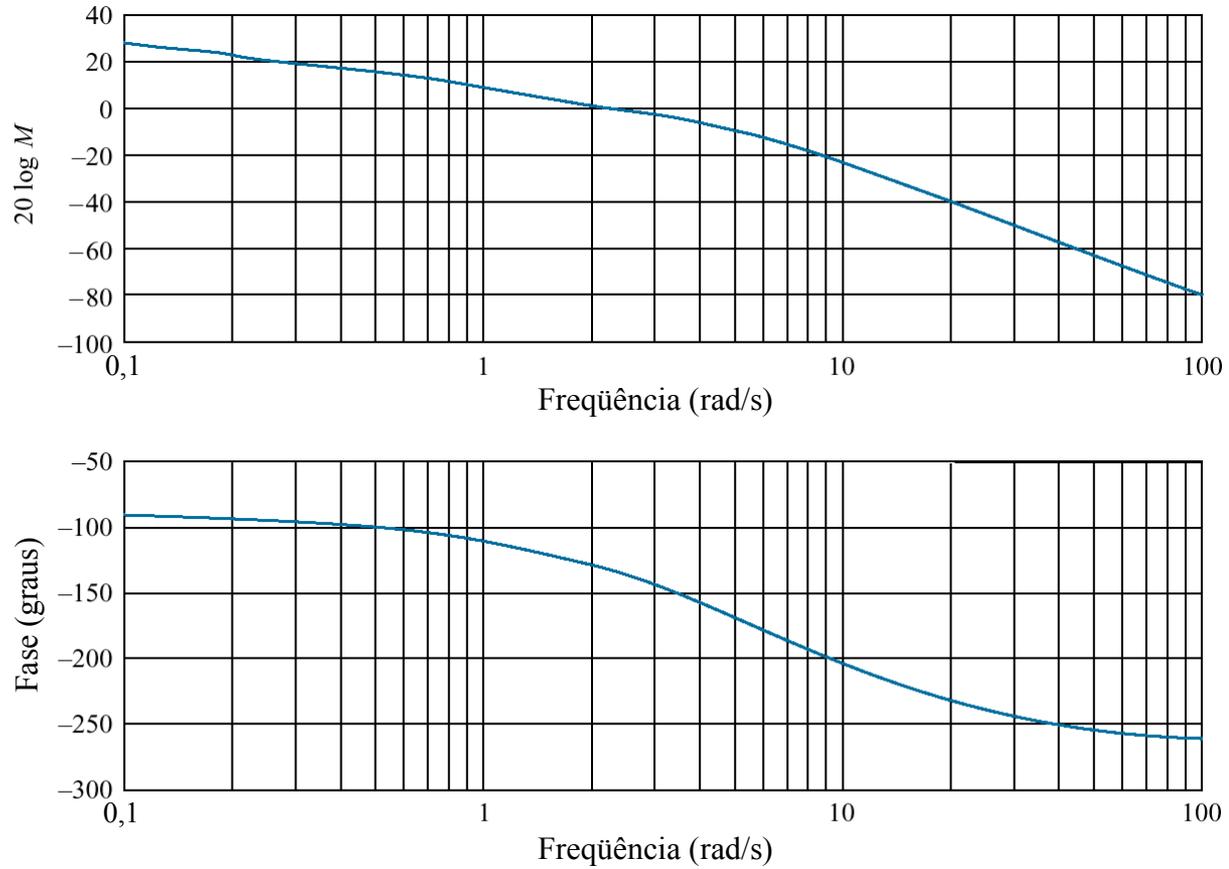
**Fig. P10.6**

Sistema 1

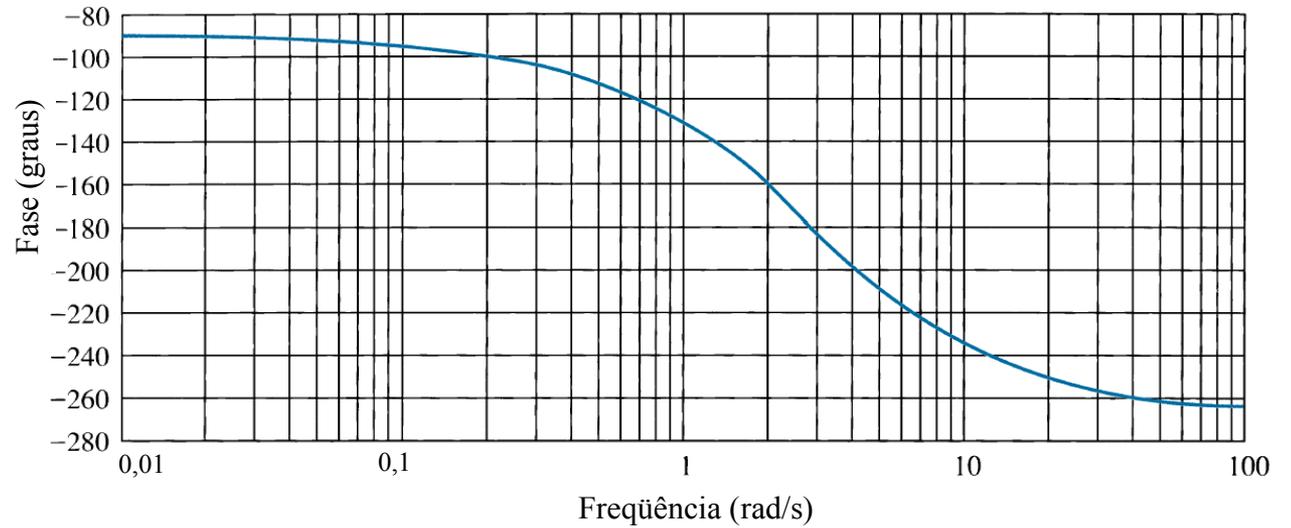
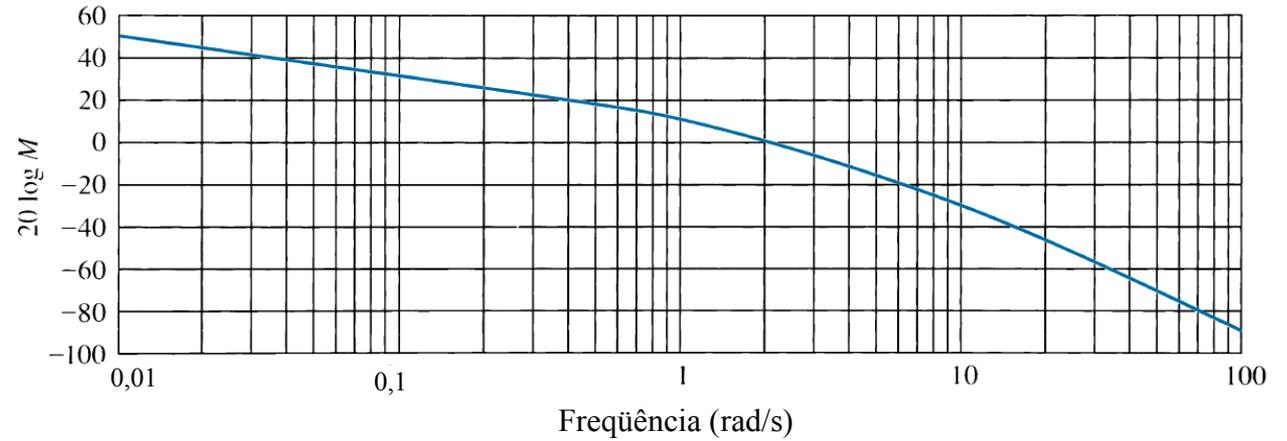


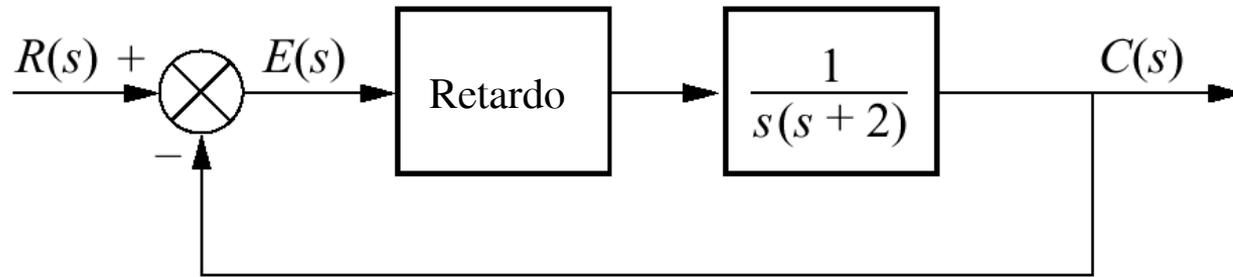
Sistema 2

# Fig. P10.7

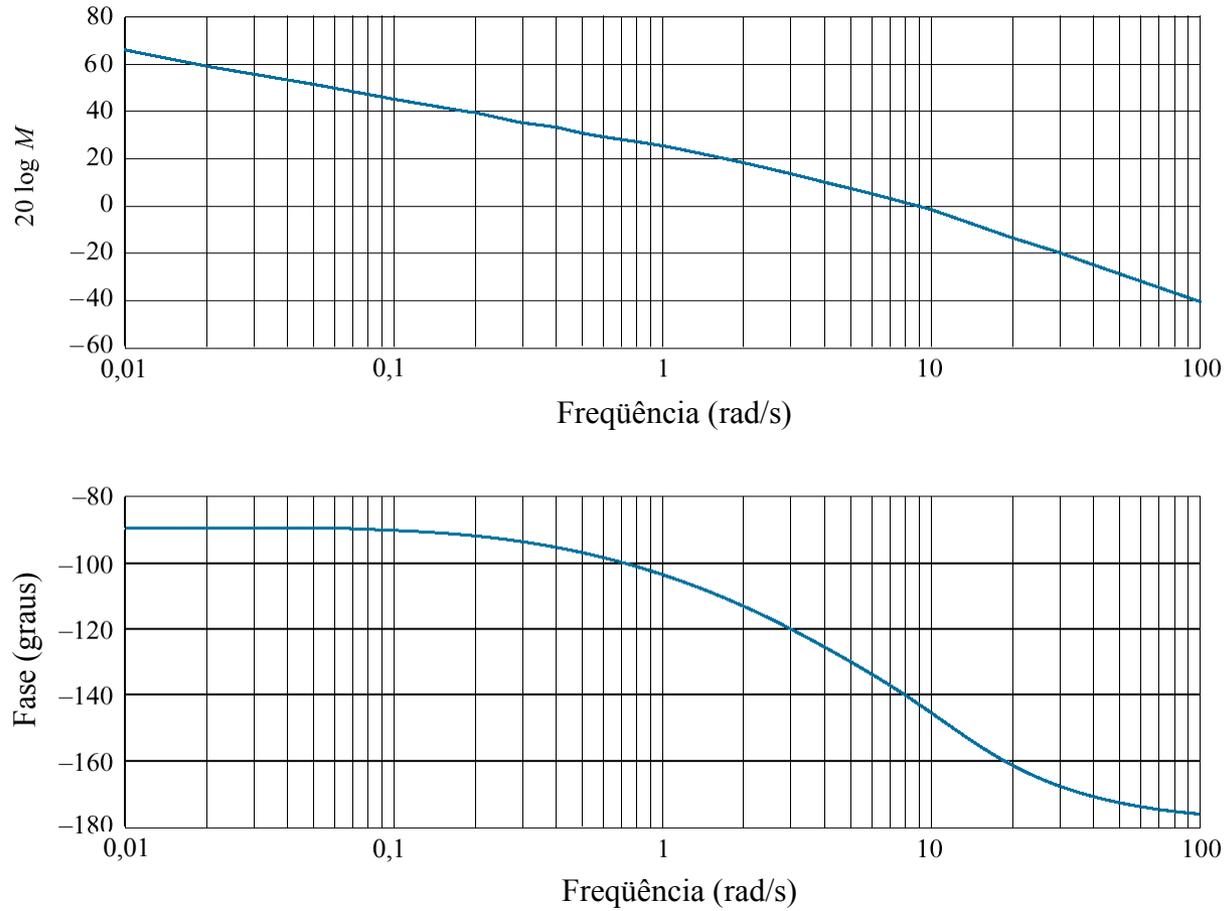


# Fig. P10.8

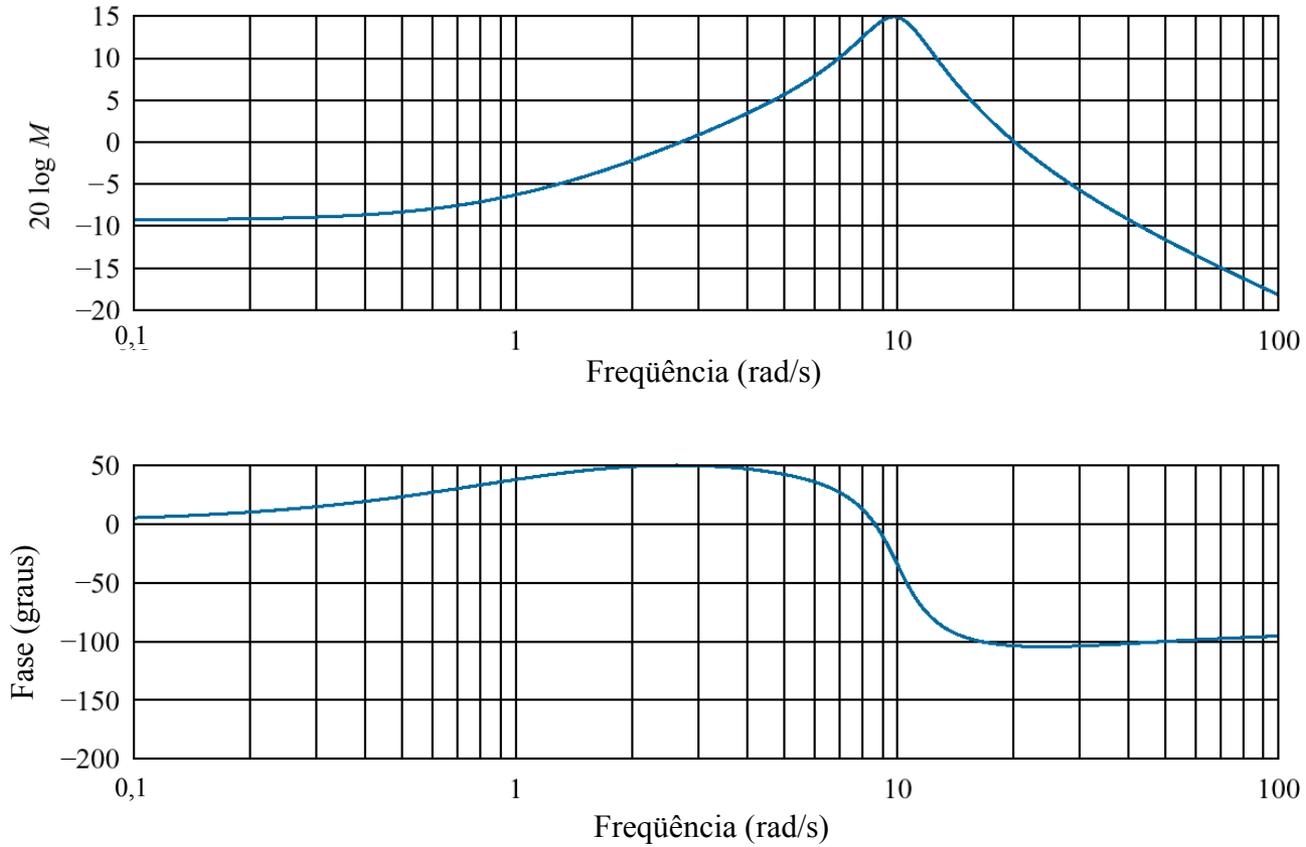


**Fig. P10.9**

# Fig. P10.10

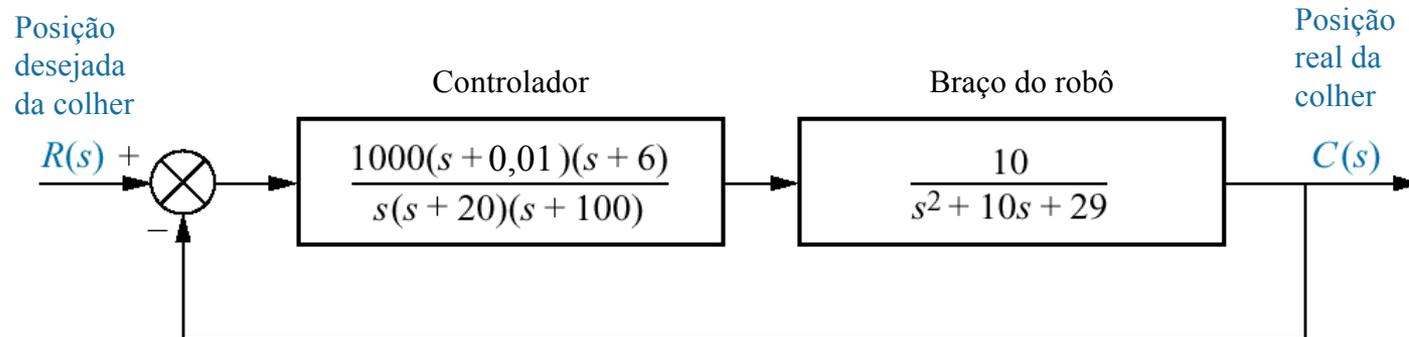


# Fig. P10.11



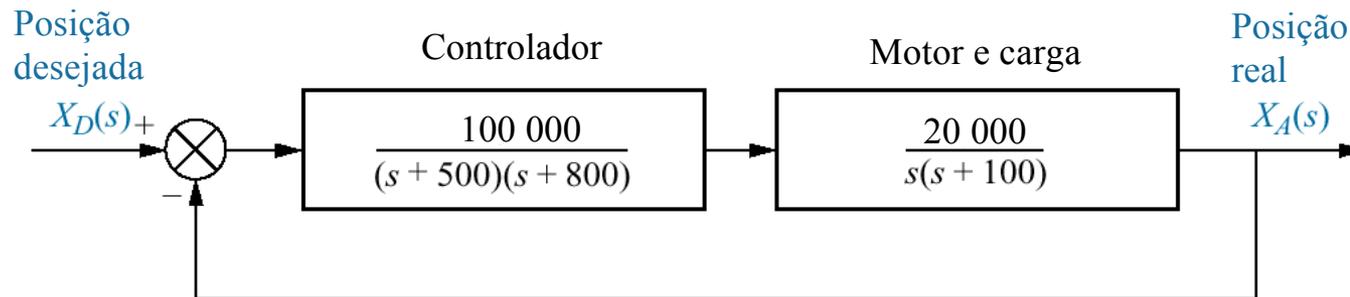
## Fig. P10.12

Diagrama de blocos do sistema de controle de posicionamento Soft Arm



## Fig. P10.13

### Diagrama de blocos de acionador de disco flexível



## Fig. P10.14

AdeptOne, um robô industrial de quatro ou cinco eixos, é usado para montagem, embalagem e outras tarefas de manufatura

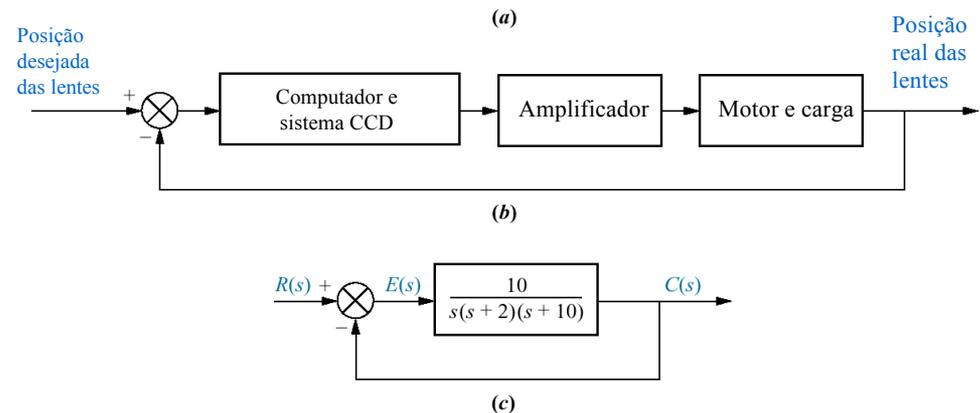


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# Fig. P10.15

- a. Vista em corte de uma câmara fotográfica Nikon 35 mm mostrando partes do sistema CCD de focalização automática;
- b. diagrama de blocos funcional;
- c. diagrama de blocos

Cortesia de Nikon, Inc.



## Fig. P10.16

Diagrama de blocos de um sistema de estabilização de rolamento de um navio

