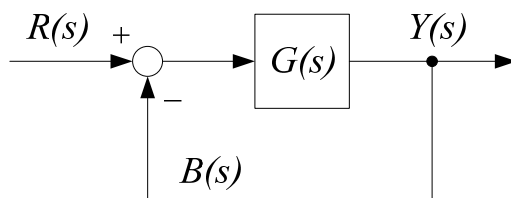


SISTEMAS DE CONTROLE II – ENGENHARIA DE CONTROLE E AUTOMAÇÃO

PROFESSOR: JOSÉ LUIZ F. BARBOSA

2ª Lista de exercícios

Considere o sistema de controle com realimentação unitária e negativa conforme a figura abaixo.



Para cada uma das funções $G(s)$ listadas seguir:

- represente os pólos e zeros no diagrama de Argand, assim como o contorno de Nyquist e **todos os pontos** de testes necessários;
- obtenha o diagrama de Nyquist do sistema de controle em análise (identificando os respectivos pontos de teste);
- verifique a respectiva condição de estabilidade em malha fechada através do critério de Nyquist.

1)
$$G(s) = \frac{1}{(s - 0,5)}$$

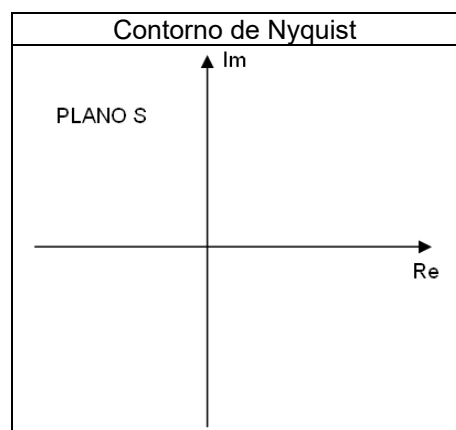
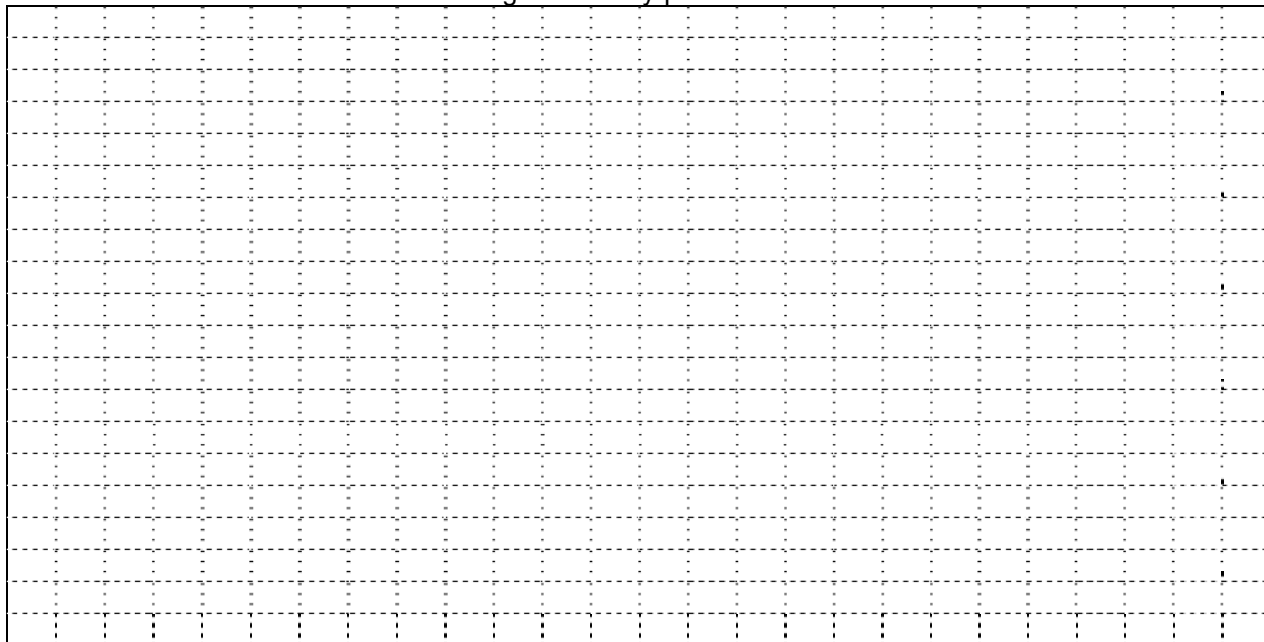


Diagrama de Nyquist:



2) $G(s) = \frac{1}{(s+1)(s-0,5)}$

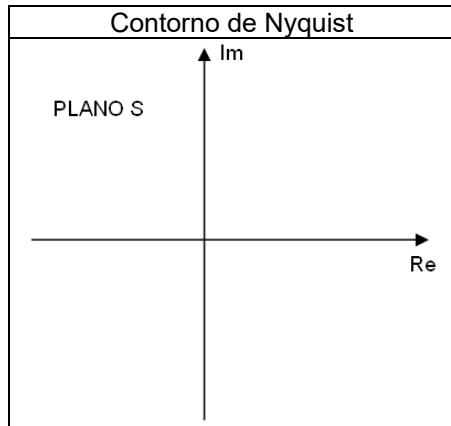
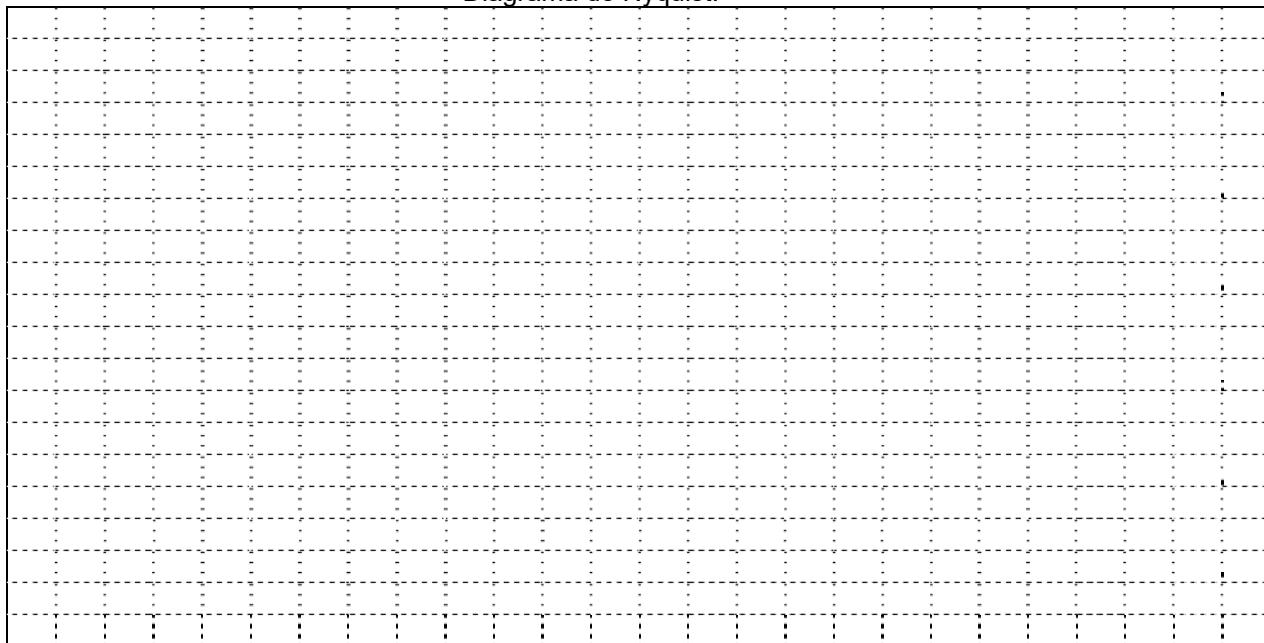


Diagrama de Nyquist:



3) $G(s) = \frac{(s+1)}{(s-0,5)}$

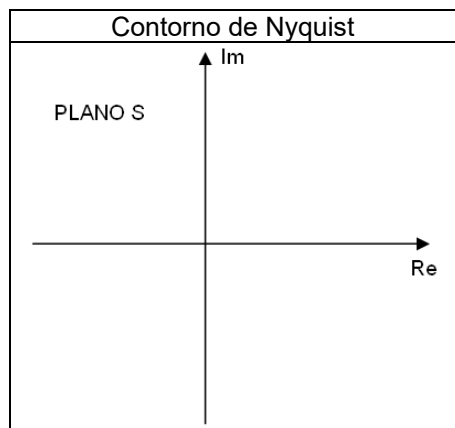
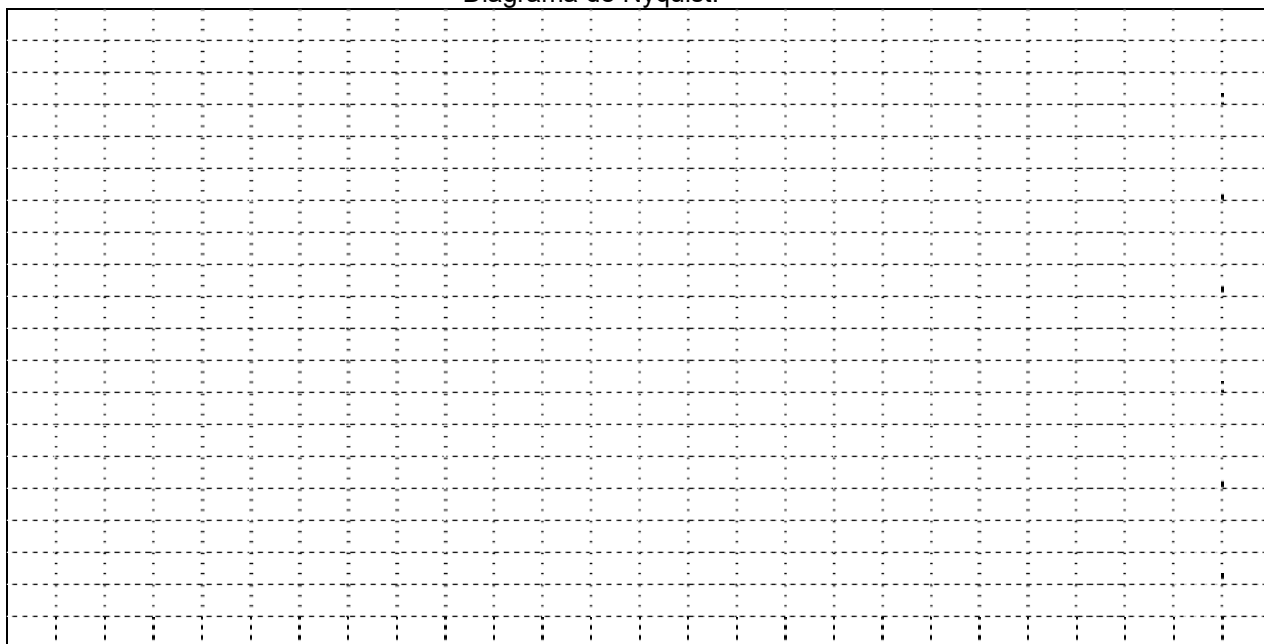


Diagrama de Nyquist:



4)
$$G(s) = \frac{1}{s^2(s+1)(s+0,5)}$$

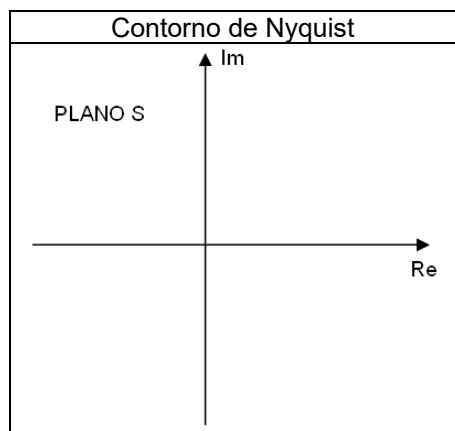
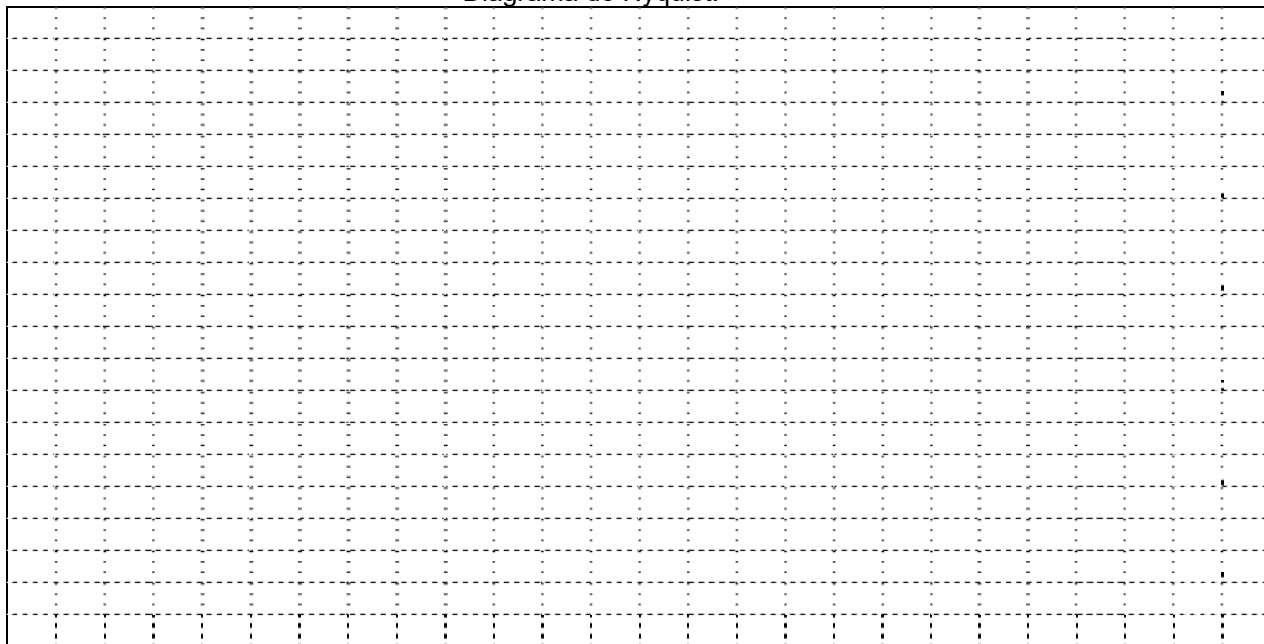


Diagrama de Nyquist:



5) $G(s) = \frac{s}{(s+1)(s+0,5)}$

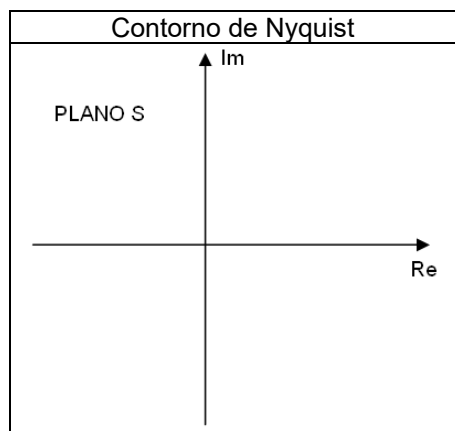
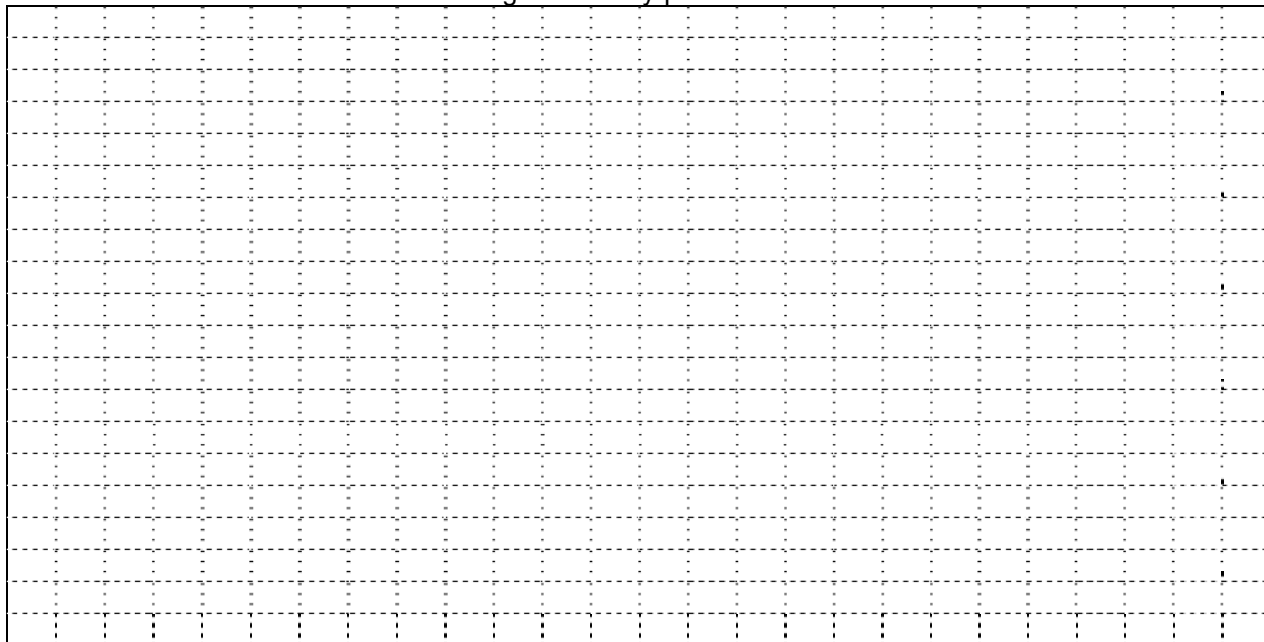
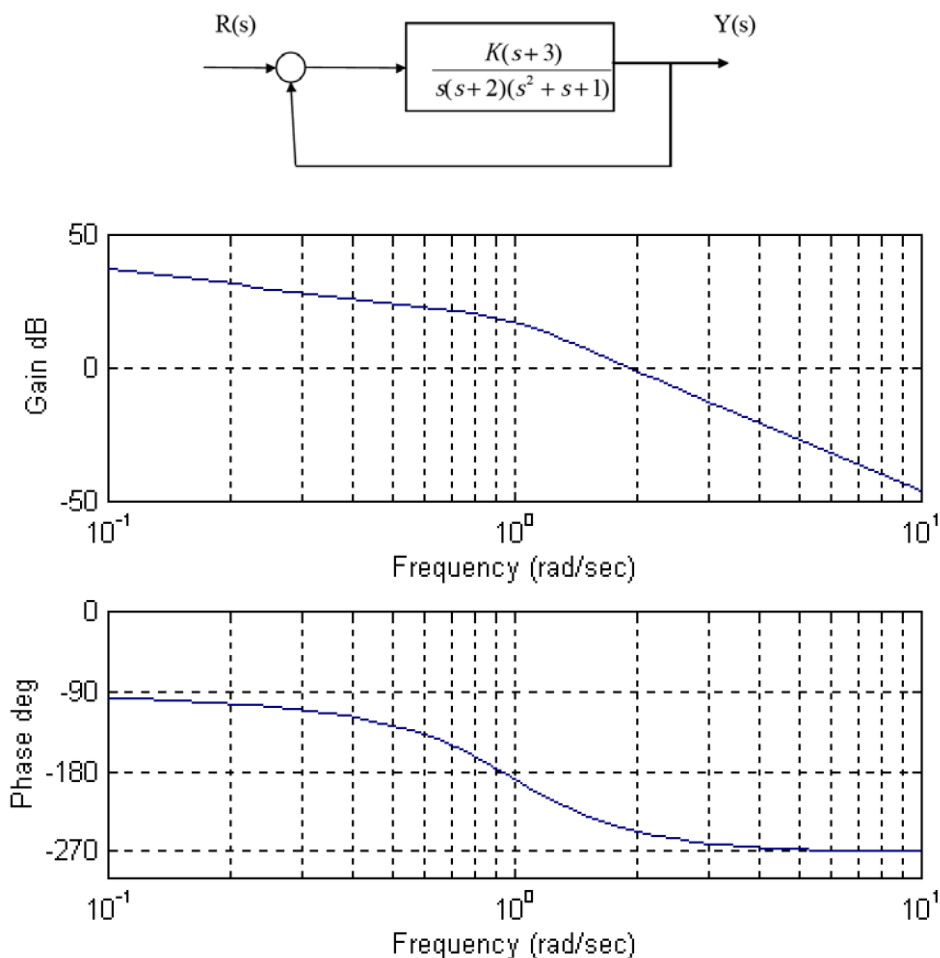


Diagrama de Nyquist:



- 6) Abaixo temos o diagrama em blocos de um determinado sistema e seu diagrama de Bode para $K = 5$.



Pede-se:

- a) Determine a margem de fase e a margem de ganho. Dizer se o sistema é estável ou instável.

- b) Faça no próprio diagrama um esboço do que acontecerá se o valor de K for alterado para $K=1$.

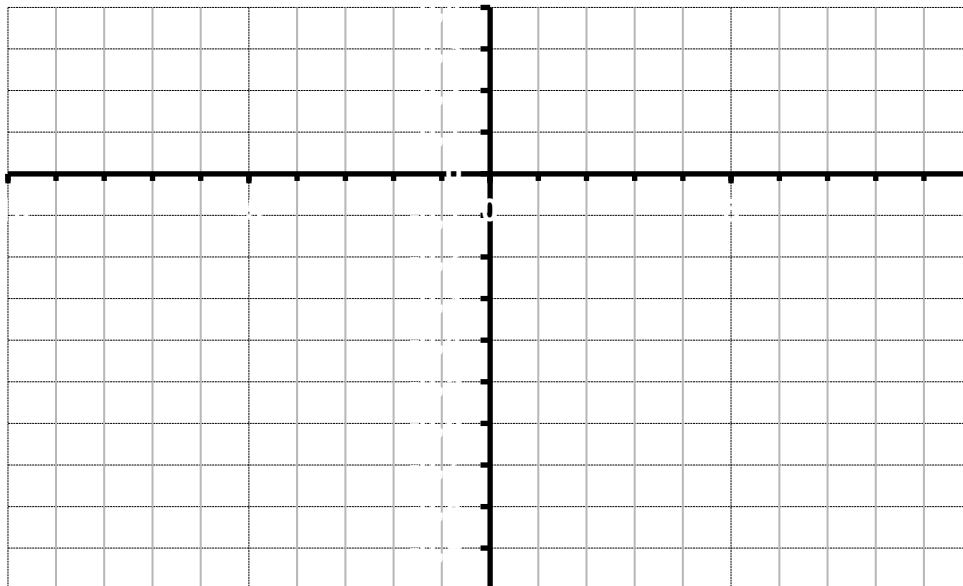
The figure consists of two vertically stacked plots sharing a common x-axis representing frequency in rad/s, ranging from 0.01 to 100 on a logarithmic scale.

The top plot shows the magnitude $20 \log M$ on the y-axis, ranging from -60 to 80. The curve starts at approximately 65 dB at 0.01 rad/s, decreases linearly with a slope of -20 dB/decade, and reaches approximately -40 dB at 100 rad/s.

The bottom plot shows the phase in degrees on the y-axis, ranging from -180 to -80. The curve starts at approximately -90 degrees at 0.01 rad/s, remains relatively flat until about 0.1 rad/s, then decreases, passing through -180 degrees at approximately 10 rad/s, and levels off at approximately -185 degrees at 100 rad/s.

[illegible]

b) Represente os pontos de frequências escolhidos na tabela anterior no plano complexo abaixo. Desenhe o gráfico polar (Nyquist) resultante.



c) Desenhe gráfico do **logaritmo do módulo em decibéis** *versus* o **ângulo de fase** (Nichols) do sistema:

