First Homework

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1. **Bode plots** Draw the Bode plots for the following systems. First by hand using the Bode plot following rules. Second using Matlab to check your results.

   (a) $G(s) = \dfrac{1}{(s+1)^2(s^2+s+3)}$

   (b) $G(s) = \dfrac{3s(s+5)}{(s+30)(4s^2+2s+6)}$

   (c) $G(s) = \dfrac{s}{(s+0.5)(s+3)(s^2+2s+1600)}$

   (d) $G(s) = \dfrac{2000(s+2)}{s(s+3)(s^2+8s+49)}$

   (e) $G(s) = \dfrac{12(s+3)}{s(s+1)(s^2+s+5)}$

   (f) $G(s) = \dfrac{1500}{s(s+5)}$

   (g) $G(s) = \dfrac{1}{s(s+1)(s^2+2s+2)}$

   (h) $G(s) = \dfrac{1}{s(1+s)(1+0.125s)}$

   (i) $G(s) = \dfrac{1000}{s(1+0.4s)(1+0.1s)}$

   (j) $G(s) = e^{-3s}\dfrac{s+1}{s^2+s+1}$

2. Draw by hand the Nyquist diagrams for the following systems (given by their loop gain), and check your result with MATLAB:

   (a) $KG(s) = \dfrac{K(s+10)}{s+100}$.

(b) $KG(s) = \dfrac{K}{(s+2)(s+0.1)^2}$.

(c) $KG(s) = \dfrac{K(s+100)(s+10)}{(s+1000)(s+1)^3}$

Estimate the range of K for which each system is stable. Check your results with MATLAB.