Modelling and control summaries

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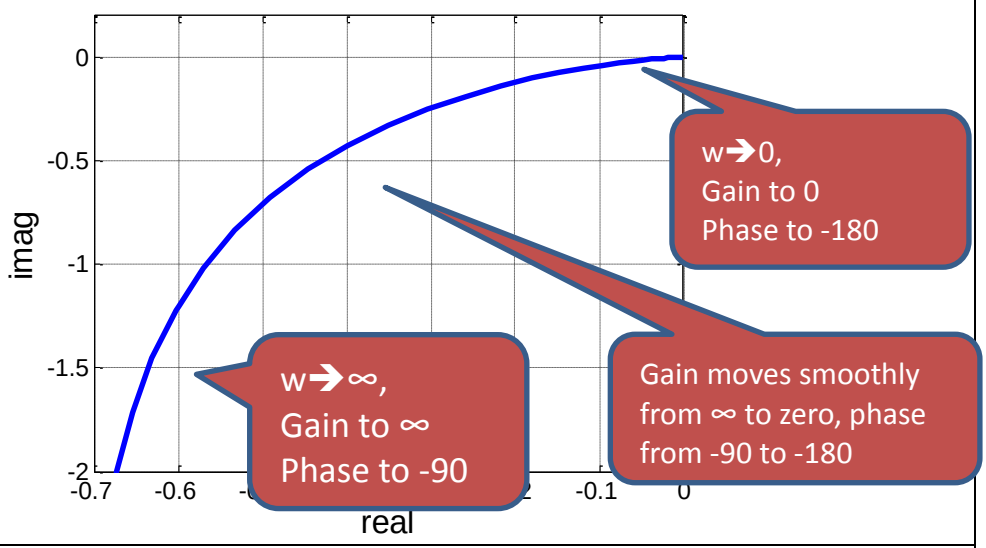
Nyquist 4: Sketching with integrators

Asymptotic methods give a rough Bode plot using simple trends: i) as w tends to zero; ii) as w tends to infinity; iii) how do gain and phase change in between.	A simple Nyquist sketch is acquired by transcribing this information into an Argand diagram. NOTE: Accuracy is important near to -1 (0dB and -180 degrees).
Some key points should be noted when an integrator is present. $\frac{1}{jw}$	• As w➔0, gain tends to infinity (typically phase tends to -90°) • As w➔ infinity, gain tends to zero.

SKETCHING NYQUIST OF DIFFERENT G(s) USING TRENDS

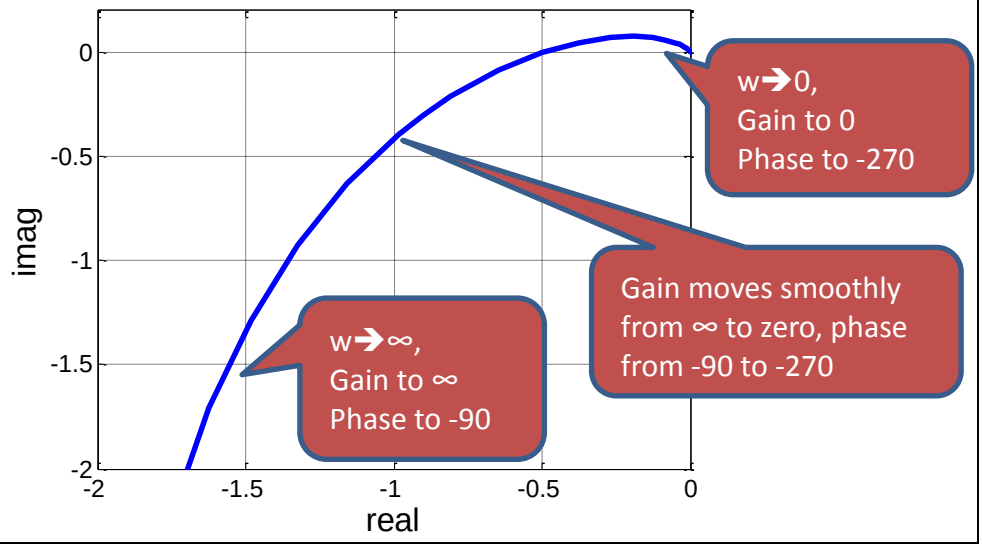
Note how initial/final values and trends can be used to form a reasonable sketch.

$$\frac{3}{s(s+2)}$$



2nd example

$$\frac{3}{s(s+1)(s+2)}$$

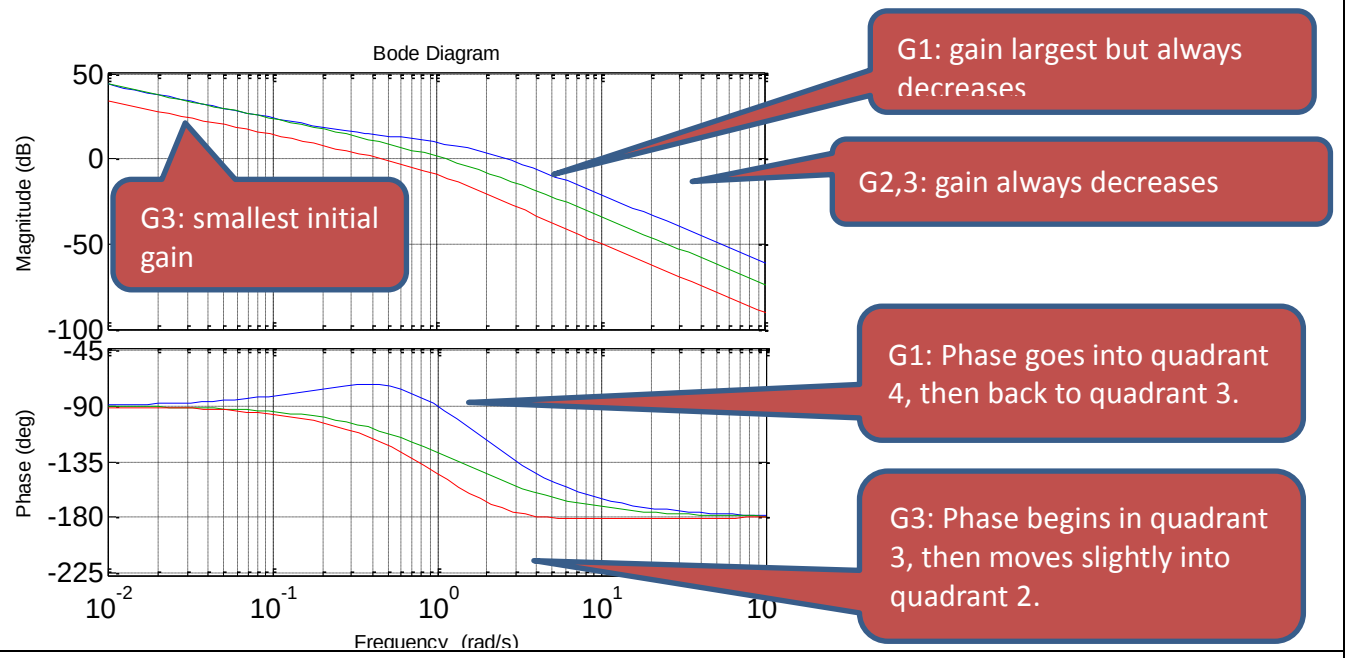


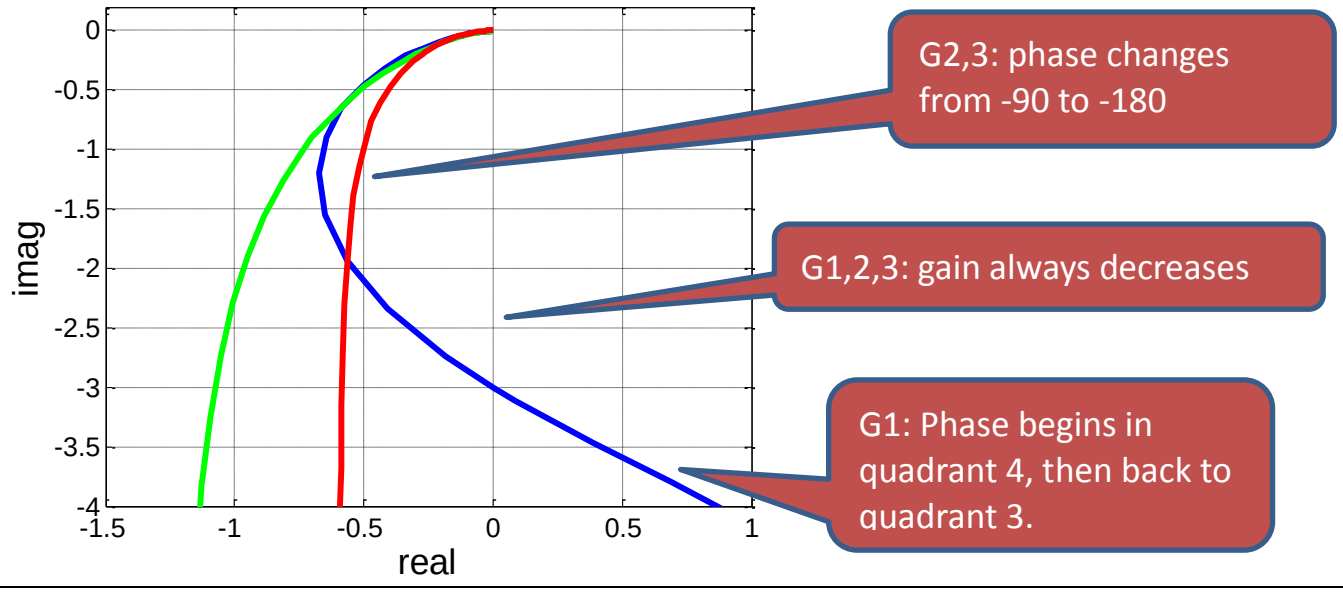
REMARKS:

1. Trends can be very useful for seeing the impact of different pole/zero positions on the resulting shapes of the Nyquist diagram.
2. This insight is invaluable later!
3. **Always a good idea to use MATLAB to check your answers**

NOTE HOW CHANGING ZERO CHANGES TREND HUGELY

$$G1 = \frac{9s+3}{s(s+1)(s+2)}; \quad G2 = \frac{2s+3}{s(s+1)(s+2)}; \quad G1 = \frac{0.3s+3}{s(s+1)(s+2)}$$



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>>G1=tf(9*[1 1/3],[1 3 2 0]);G2=tf([2 3],[1 3 2 0]);G3=tf([0.3 1],[1 3 2 0]);
>>bode(G1,G2,G3)
>>nyquist(G1,G2,G3)
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