

Modelling and control summaries



by Anthony Rossiter

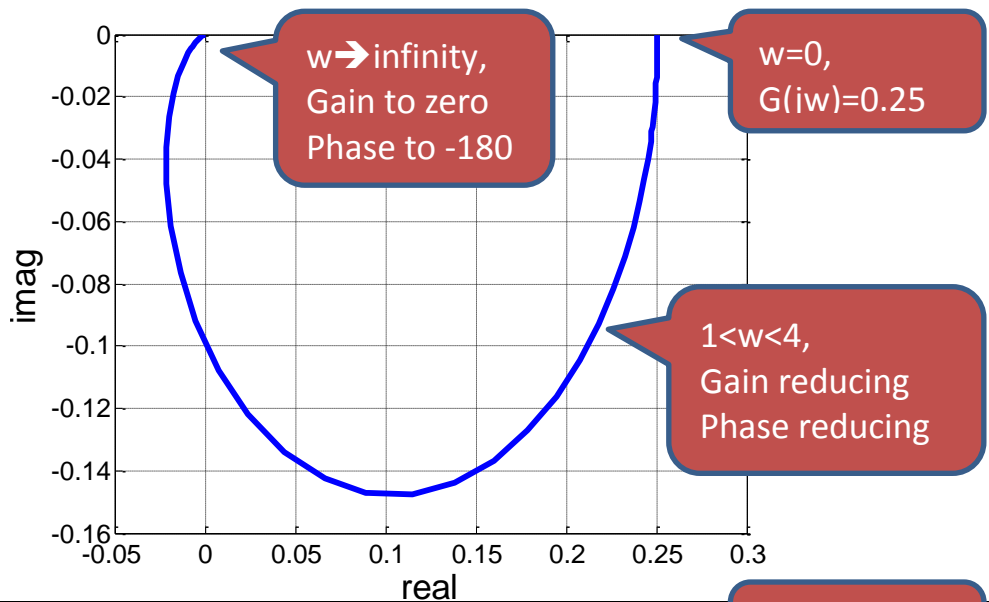
Nyquist 3: Illustrations of sketching



SKETCHING NYQUIST OF DIFFERENT $G(s)$ USING TRENDS

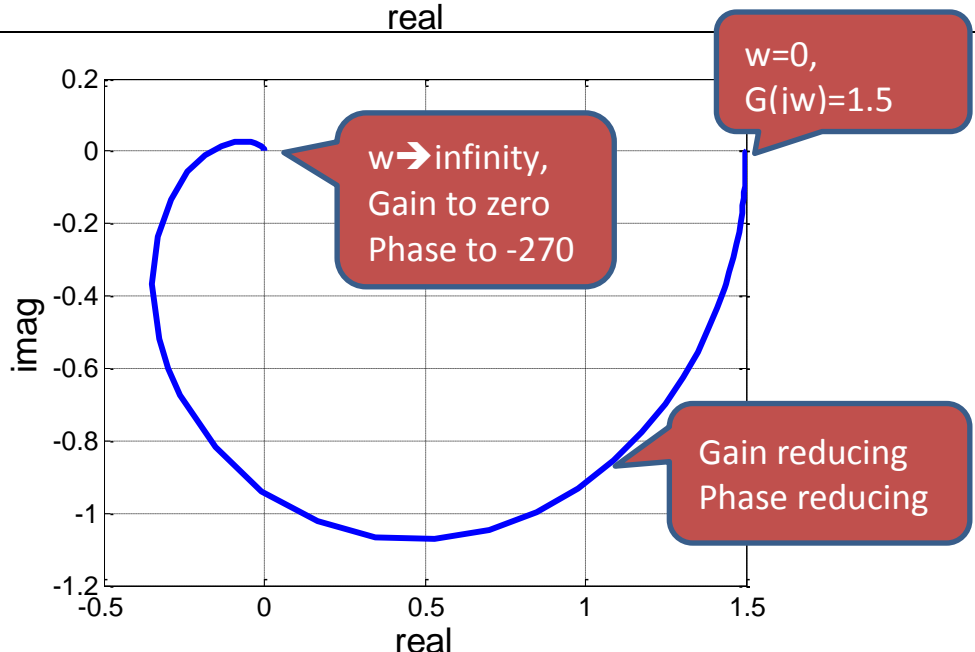
Note how initial/final values and trends can be used to form a reasonable sketch.

$$\frac{1}{(s+1)(s+4)}$$



2nd example

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

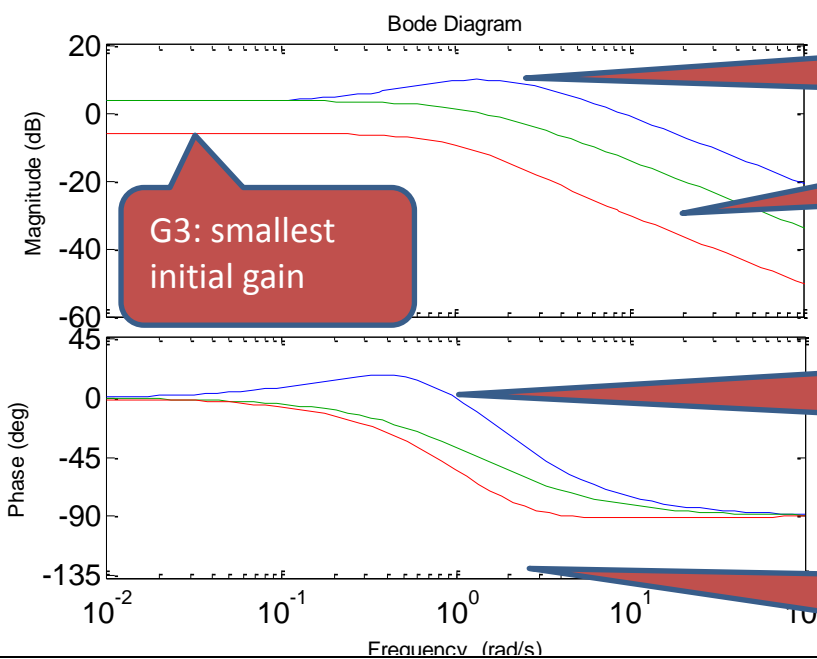


REMARKS:

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

$$G1 = \frac{9s+3}{(s+1)(s+2)}; \quad G2 = \frac{2s+3}{(s+1)(s+2)}; \quad G3 = \frac{0.3s+3}{(s+1)(s+2)}$$



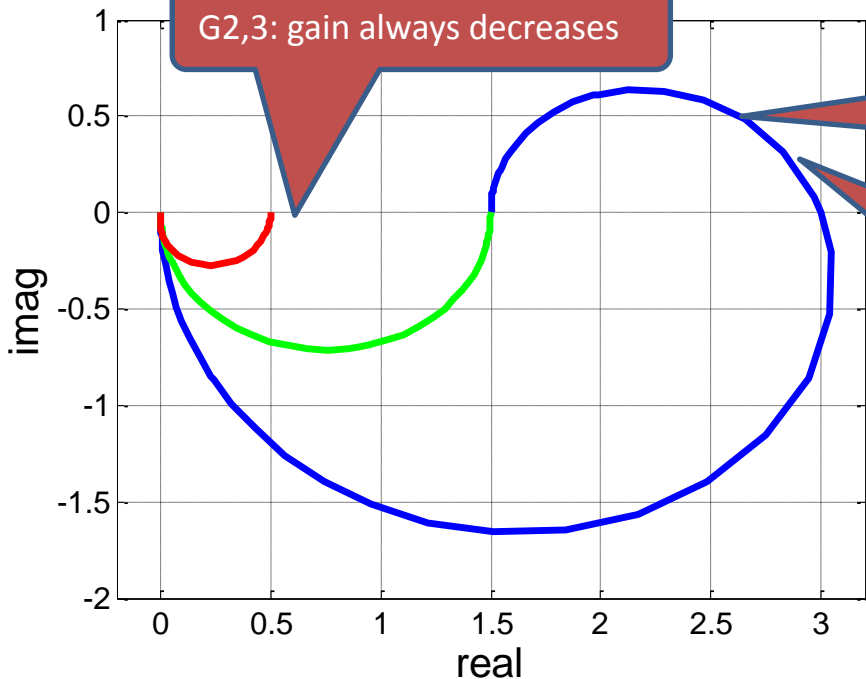
G1: gain increases and then decreases

G3: smallest initial gain

G2,3: gain always decreases

G1: Phase goes into quadrant 1, then back to quadrant 4.

G3: Phase begins in quadrant 4, then moves slightly into quadrant 3.



G2,3: gain always decreases

G1: gain increases and then decreases

G1: Phase goes into quadrant 1, then back to quadrant 4.