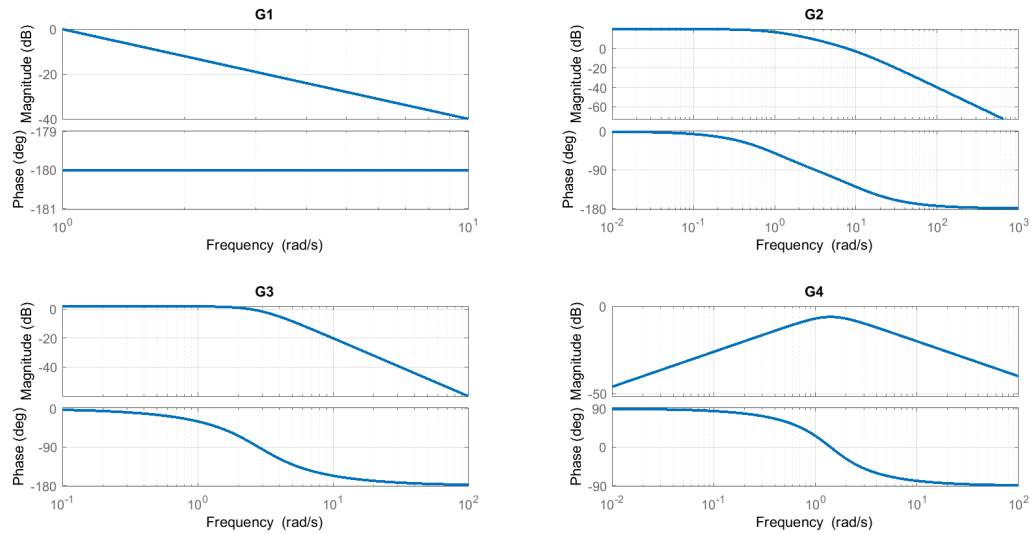
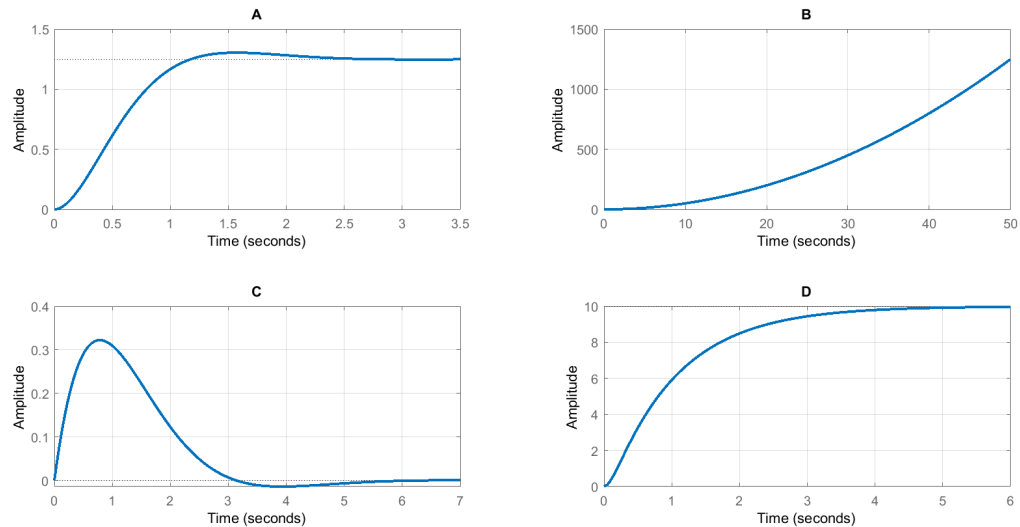


## 6.11 Matching Step Responses with Their Corresponding Bode Plots

Match the Bode plots



with the step responses.



**Solution :**

$$G_1 - B, G_2 - D, G_3 - A, G_4 - C$$

**GPT Answer :**

Based on the analysis of the Bode plots and the corresponding step responses, the tentative matches are as follows:

- Step response A with Bode plot G3.
- Step response B with Bode plot G1 (with low confidence).
- Step response C with Bode plot G4.
- Step response D with Bode plot G2.

**Confidence Level: approximately 75%**

**Correct**

**Claude Answer :**

Here is my analysis matching the Bode plots to the step responses, with LaTeX code:

The Bode plots correspond to the following step responses:

- $G1 \rightarrow B$ :  $G1$  has a low frequency gain around 0 dB and rolls off at high frequencies, consistent with the first-order step response that settles to a steady-state value in plot B.
- $G2 \rightarrow A$ :  $G2$  has a resonant peak around 10 rad/s, indicating an underdamped second-order system. This matches the underdamped step response in A with overshoot and ringing.
- $G3 \rightarrow D$ :  $G3$  has a resonant peak and a steeper high frequency rolloff compared to  $G2$ , suggesting a higher-order underdamped system. The step response in D shows even more overshoot and oscillation than A, consistent with a higher-order underdamped response.
- $G4 \rightarrow C$ :  $G4$  has the highest DC gain but rolls off at the lowest frequency with a gentle slope, indicating an overdamped response. Plot C shows an overdamped step response that rises slowly without overshoot, matching the Bode plot of  $G4$ .

**Confidence level: 90%**

**Misreading The Plot**