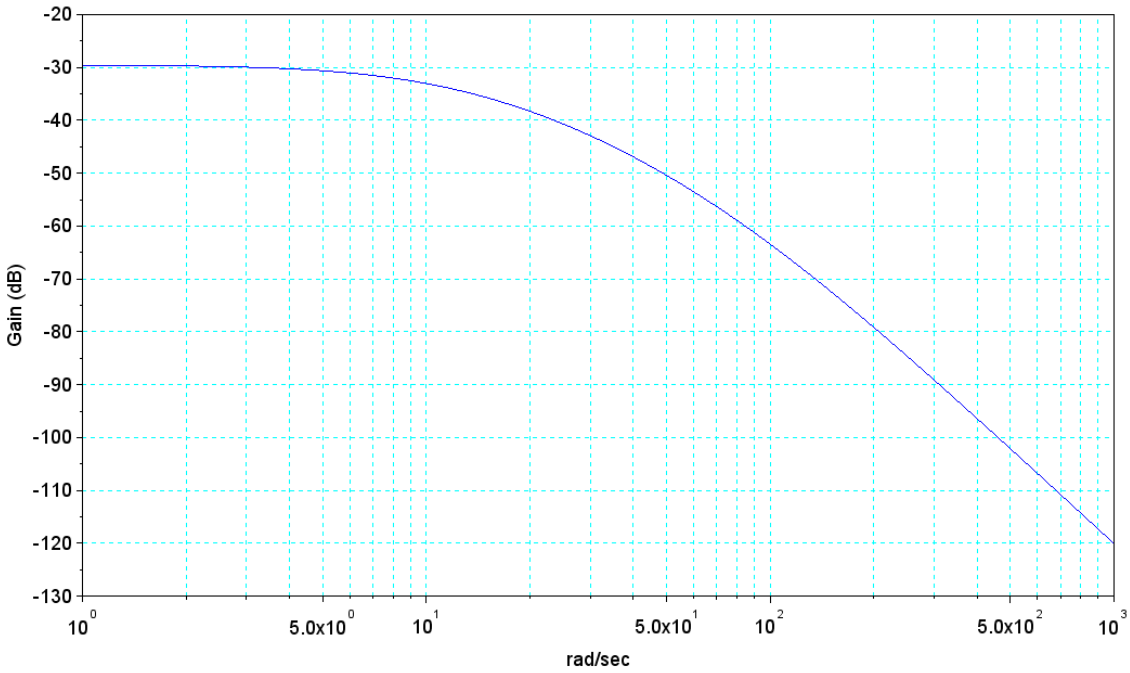
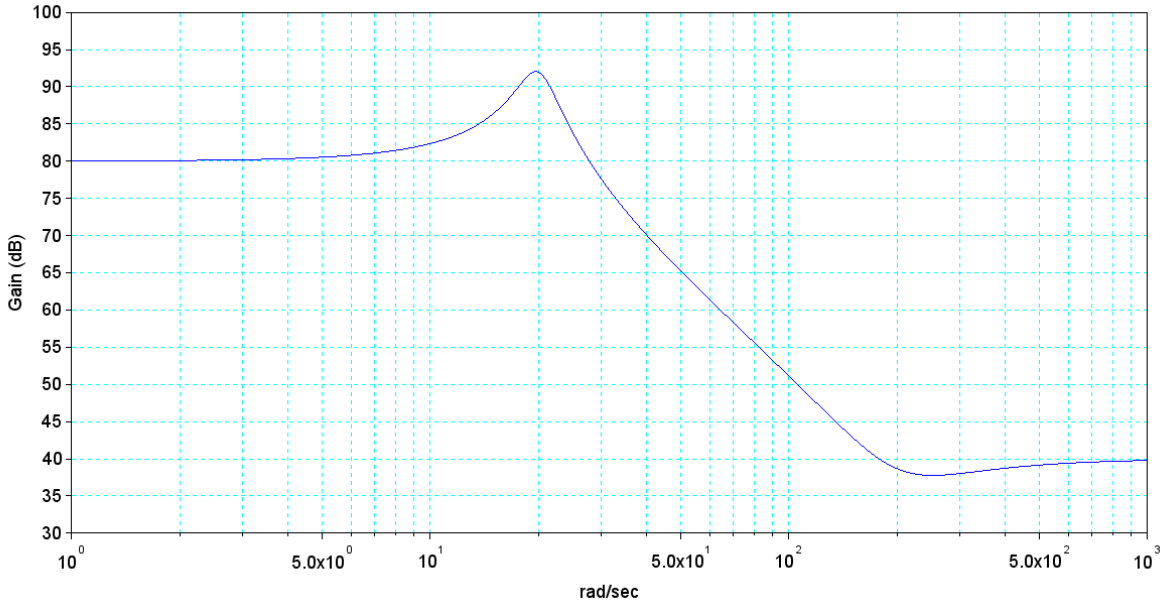
ECE 461 - Homework #12

Compensator Design in the Frequency Domain. Due Wednesday, December 9th

1) Find the transfer function for a system with the following gain vs. frequency



2) Find the transfer function for a system with the following gain vs. frequency



3) Determine the corresponding parameters

Dominant Pole	Damping Ratio	Resonance Mm	Phase Margin	0dB Gain Freq
-3 + j9				
	0.3			5 rad/sec
		+7dB		10 rad/sec
			30 degrees	15 rad/sec

4) Determine the transfer function for a 10-stage RC filter with

- R = 1/10 Ohm
- C = 1/10 F

5) Determine a 3rd-order model which has approximately the same response as the 10th-order system of problem 4

6) Design a gain compensator for the 3rd-order system which results in a phase margin of 30 degrees

7) Design a PI compensator for the 3rd-order system which results in

- No error for a step input, and
- A phase margin of 30 degrees

8) Design a compensator for the 3rd-order system which results in

- No error for a step input,
- A phase margin of 30 degrees, and
- A 0dB gain frequency of 2 rad/sec

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9) Test your controller in problem #8 on

- the 4th-order system and
- the 10th-order system

using a MATLAB or VisSim simulation