

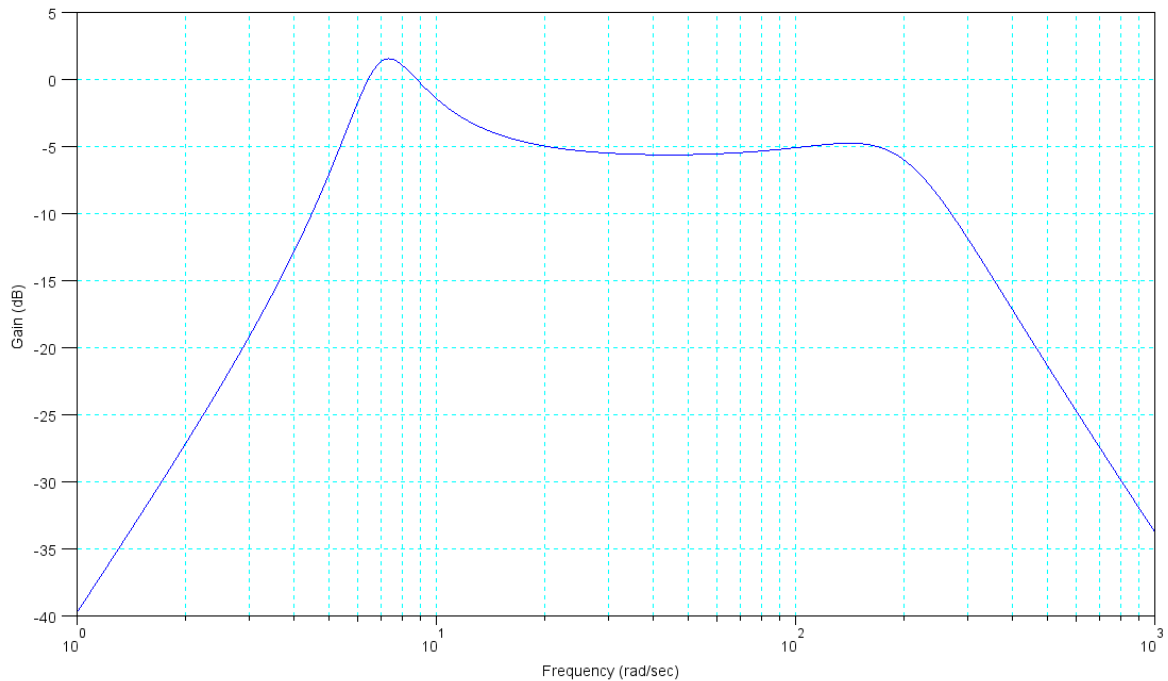
# ECE 461/661 - Homework Set #12

Root Locus in the z-plane - Due Wednesday, December 7th

1) Determine the corresponding values (revised)

| Dominant Pole | Damping Ratio | Resonance Mm | Phase Margin | 0dB Gain Freq |
|---------------|---------------|--------------|--------------|---------------|
| $-2 + j9$     |               |              |              |               |
|               | 0.3           |              |              | 10 rad/sec    |
|               |               | +4dB         |              | 10 rad/sec    |
|               |               |              | 30 degrees   | 15 rad/sec    |

2) Determine the system that has the following gain vs. frequency



A 4th-order model for the 10-stage RC filter from homework #6 is

$$G(s) \approx \left( \frac{22}{(s+10.2)(s+5.539)(s+2.181)(s+0.4234)} \right)$$

3) Gain Compensation: Design a gain compensator so that the closed-loop system has

- A phase margin of 40 degrees.

4) Design a PI compensator so that the closed-loop system has

- No error for a step input, and
- A phase margin of 40 degrees.
- A 0dB gain frequency of 3 rad/sec

(skip number 5)

~~5) Design a compensator,  $K(s)$ , so that the closed-loop system has~~

- ~~• No error for a step input, and~~
- ~~• A phase margin of 40 degrees.~~
- ~~• A 0dB gain frequency of 3 rad/sec~~