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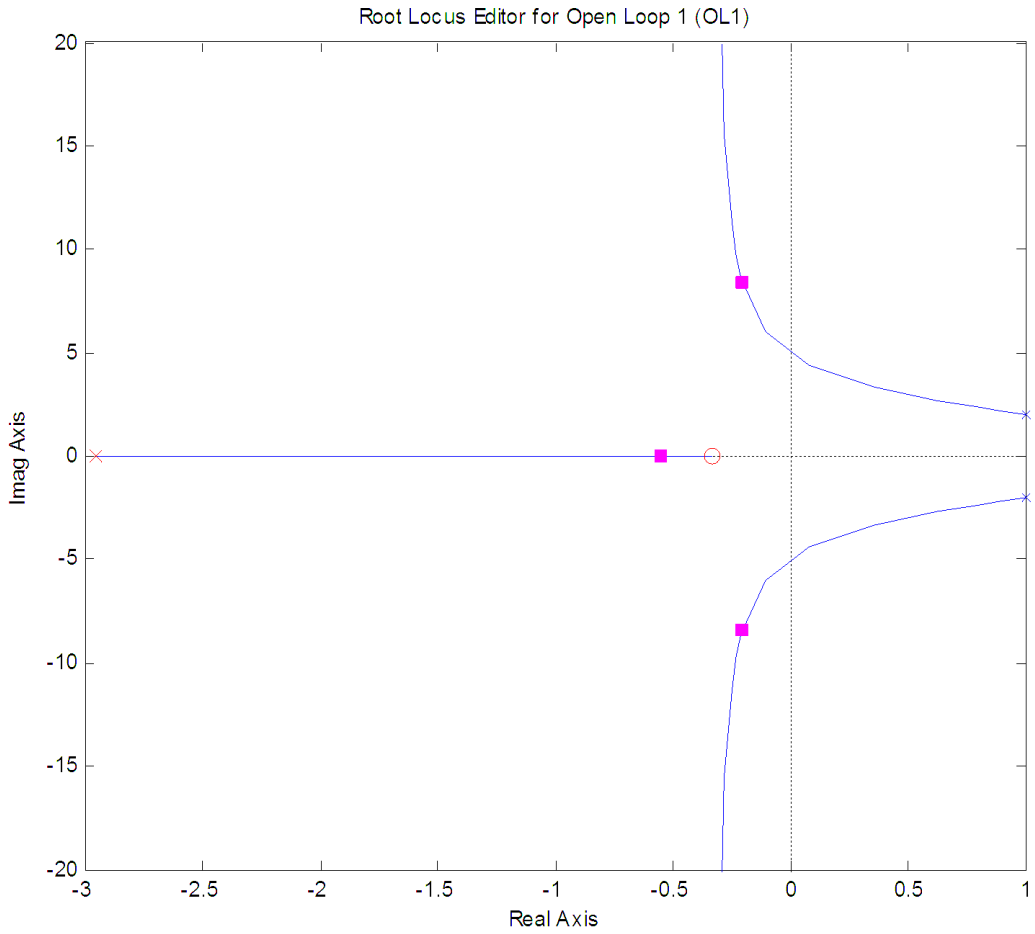
ECE-320, Quiz #3

Problems 1-3 refer to the following root locus plot for a unity feedback system with a plant and a controller.



1) Based on this root locus plot, the best estimate of the poles of the closed loop system are

a) -0.3+j7, -0.3-j7, -0.6 b) 1+j2, 1-j2, and -3

2) Is this a type one system? a) yes b) no

3) Is this a stable system? a) yes b) no

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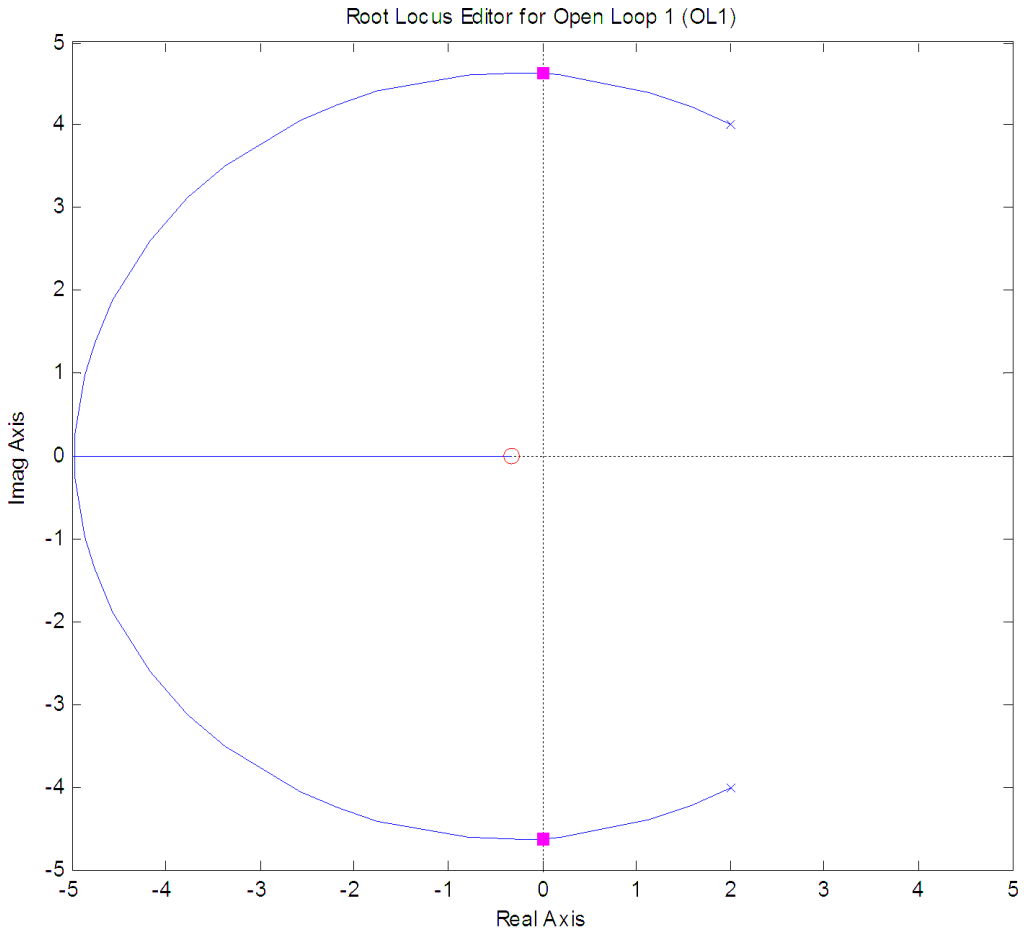
4) Consider the following root locus plot for a plant and controller in a unity feedback configuration.

If we want the system to be stable, should we

a) increase the gain b) decrease the gain c) do nothing



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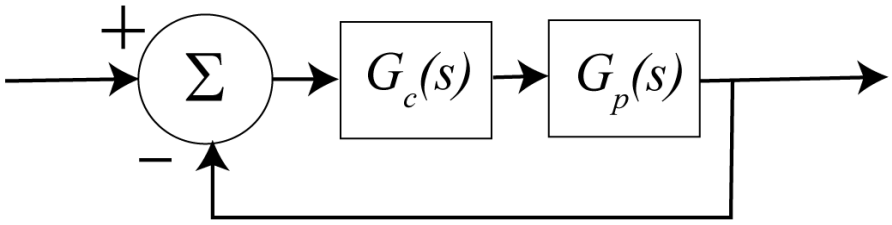
Problems 5-10 refer to the following feedback system with plant $G_p(s) = \dfrac{1}{(s+3)(s+4)}$



5) If we use a proportional controller $G_c(s) = k_p$ will the system remain stable for all positive values of k_p?

a) yes b) no

6) If we use a proportional controller $G_c(s) = k_p$ is there any value of k_p for which the settling time is less than 0.5 seconds?

a) yes b) no

7) If we use an integral controller $G_c(s) = \dfrac{k_i}{s}$ will the system remain stable for all positive values
of k_i?

a) yes b) no

8) If we use an integral controller $G_c(s) = \dfrac{k_i}{s}$ is there any value of k_i for which the settling time is less than 0.5 seconds?

a) yes b) no

9) For which of the following PID controllers will the settling time be smaller as $k \to \infty$

a) $G_c(s) = \dfrac{k(s+2+j)(s+2-j)}{s}$ b) $G_c(s) = \dfrac{k(s+4+2j)(s+4-2j)}{s}$
c) the results will be the same

10) For which of the following PD controllers will the settling time be smaller as $k \to \infty$

a) $G_c(s) = k(s+5)$ b) $G_c(s) = k(s+10)$ c) the results will be the same

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11) The standard form for a PID controller is

$$G_c(s) = k_p + \frac{k_i}{s} + k_d s$$

For the following PID controller $G_c(s) = \frac{5(s^2 + 2s + 1)}{s}$ determine k_p, k_i, and k_d