

The objective of this homework is to test your understanding of the content of Module 7. Due date of the homework is: **Monday, March 21st, 2016, @ 10am.**

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Plot the root-locus for the following **unity-feedback** systems. You should apply the 10 Rules we discussed in class; you should find breakaway/break-in points, angle of departures, asymptotes,  $j\omega$ -axis crossings, and range of  $K$  such that the system is stable. You should also verify your solutions via MATLAB.

1.  $G(s) = K \frac{s^2 + 4s + 8}{s(s - 2)}$

2.  $G(s) = K \frac{1}{(s^2 + 2s + 2)(s^2 + 2s + 5)}$

3.  $G(s) = K \frac{(s + 1)}{s(s + 2)(s + 3)(s + 5)}$

4.  $G(s) = K \frac{s + 3}{s^2 + 2s + 5}$ .

5. Draw the Root-Locus given that this is the characteristic polynomial of the closed-loop system:

$$(1 + K)s^2 + (2 - 2K)s + 2K = 0.$$

*Hint: for Problem 5, you should write the polynomial as  $1 + KG(s) = 0$ , and then follow the typical steps to draw the root-locus.*