# Control Systems    Assignment # 4

issued: 16/06/2022

due: 23/06/2022

## Problem 1

Sketch the root locus of the following systems (you may verify your sketch using MATLAB)

a) $G(s) = \frac{s+1}{s^2+2s+2}$

b) $G(s) = \frac{s^3+5s^2+9s+12}{s^4+7s^3+2s^2+s-1}$

c) $G(s) = \frac{1+10s}{s^5+3s^4}$

## Problem 2

Find the value of gains (gain of root locus as well as gains of controller) for which the root locus cuts j-w axis in the following systems (you can verify your results using MATLAB but MUST show calculations).

a) $G(s) = \frac{1}{(s^2+4s+4)(s+3)}, C(s) = \frac{5K}{s+5}$

b) $G(s) = \frac{1}{(s-2)^4}, C(s) = K_1 + K_2 s$

## Problem 3

Sketch Root contour for the following systems

a) $G(s) = \frac{1}{(s^3+3ps^2+7ps-9p)}$

b) $G(s) = \frac{s+1}{qs^2+3s+1}$

c) $G(s) = \frac{1}{ps^2+3ps-p}$