Tutorial 2 Stability Analysis

Question 1
Show that for the system $s^2 + (12 - 3K_c)s + (20 + 0.25K_c) = 0$, the condition for stability is $-80 < K_c < 4$.

Question 2
A unity negative feedback system has a controller K(s) and plant $2/(s^3+4s^2+5s+2)$ in the forward path. Design K(s) for stabilised closed-loop control for:

a) K(s)= K_c, proportional controller ***$-1 < K_c < 9$***
b) K(s)=$K_p + K_I/s$, PI controller ***$K_I > 0; K_I < (1+K_p)(9-K_p)/8$***