Q.1 A process is described by a third-order ODE:

$$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y = 4\frac{du}{dt} + 2u$$

with all initial conditions y, u, dy/dt, and d^2y/dt^2 equal to zero. Show that for a step change in u of 1 unit, the steady-state result in the time domain is the same as applying the final value theorem

Q.2 Find the inverse Laplace transform of the following

a) $\frac{11}{(s-1)^3}$

b) $\frac{4s-2}{s^2-4s+13}$

c) $\frac{s+1}{s^2(s^2+4s+5)}$

d) $\frac{1+e^{-2s}}{(4s+1)(3s+1)}$