

(Q1) Check whether the following signals systems are (i) static or dynamic (ii) linear or non-linear (iii) causal or non-causal & (iv) time invariant or time variant.

(a) $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y + 4 = x(t)$

(b) $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 3y^2 = x(t+1)$

(c) $\frac{d^2y}{dt^2} + 2y\frac{dy}{dt} + 3ty = x(t)$

(d) $y(t) = ax(t) + bt^2x(t-2)$

(Q2) Check only for linearity for the following systems:

(a) $\frac{dy}{dt} + 2t^2y = tx(t)$

(b) $\frac{dy}{dt} + y^2 = 3x(t)$

(c) $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 3y = x\frac{dx}{dt}$

(Q3) Comment on the linearity & causality

(i) $y(t) = \int_{-\infty}^t x(t) dt$

(ii) $y(t) = \int_{-\infty}^{2t} x(t) dt$

(iii) $y(t) = \int_{-\infty}^{t/2} x(t) dt$

(Q4) Check whether the following systems are time invariant or not.

(a) $y(t) = x(t) + tx(t-1)$

(b) $y(t) = x(t) \cos 2t$

(c) $y(t) = x(-t/4)$

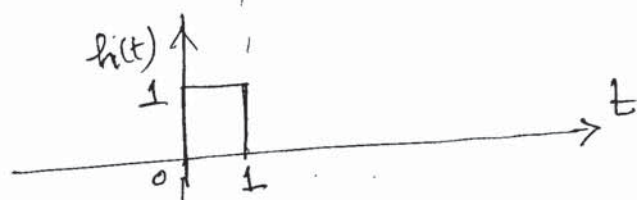
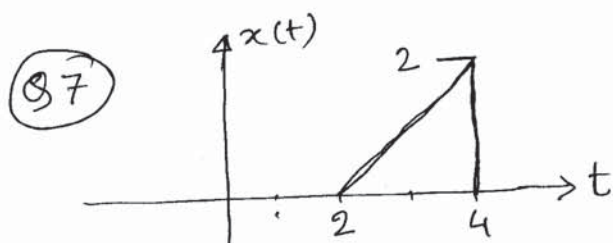
Q5 Find $y(t) = x(t) * h(t)$ when

(a) $x(t) = e^{-t} u(t)$ and $h(t) = u(t)$

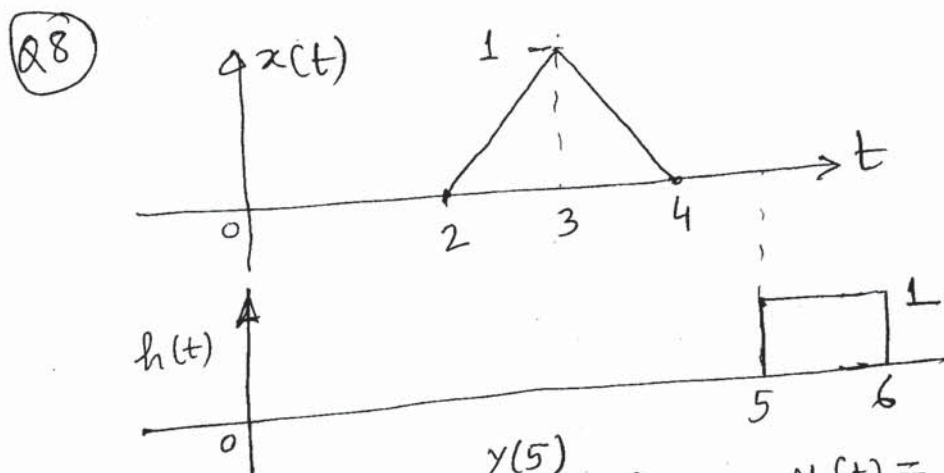
(b) $x(t) = u(t)$ and $h(t) = u(t)$

(c) $x(t) = e^{-t} u(t)$ and $h(t) = e^{-3t} u(t)$

Q6 Find $y(t) = x(t) * h(t)$ for $x(t) = e^{-3t} u(t)$ and $h(t) = u(t-3) - u(t-5)$ graphically.



Get $y(t) = x(t) * h(t)$ and sketch $y(t)$.



Calculate (i) $y(5)$ where $y(t) = x(t) * h(t)$
 (ii) if time permits get $y(t)$ and sketch it.