Solution (1)

Solution

Parallel and series connections of LTI subsystems always yield LTI systems so the system $\boxed{\text{is LTI.}}$

$$h(t) = \frac{\mathrm{d}}{\mathrm{d}t} h_1(t) * h_2(t) + h_3(t) = \boxed{(t-1)u(t-1) + \delta(t-3).}$$

Solution(2)

Solution

$$y(t) = \int_{-\infty}^{\infty} h(\tau)x(t-\tau)\,d\tau = \boxed{x(t-3) + \int_{-\infty}^{t-1} (t-\tau-1)x(\tau)\,d\tau.}$$