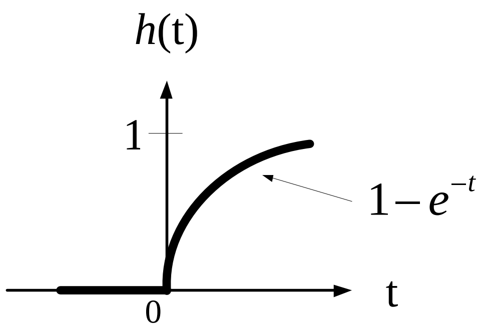
EE 207-Winter 2015(142)
Hw2 Due (5/3/2015)
Dr. Adil Balghonaim

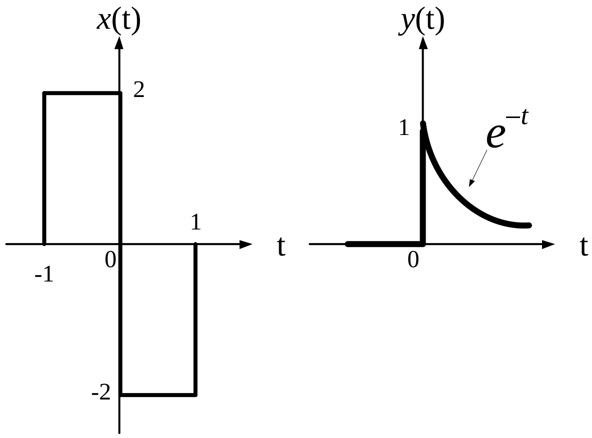
Q1 Let the impulse response $h(t)$ for a linear time invariant system as shown below



The system is

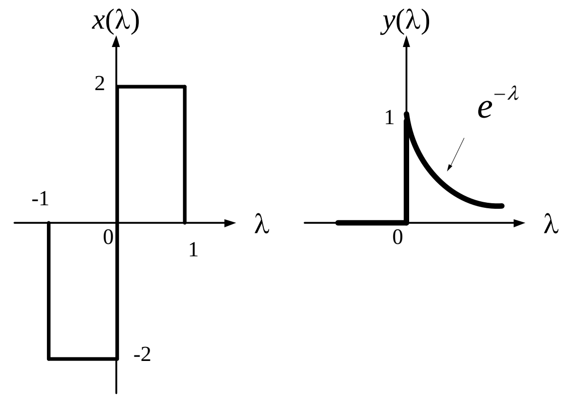
Has memory	$h(t) \neq \delta(t)$
Causal	$h(t) = 0$ for $t < 0$
Not Stable BIBO	$\int_{-\infty}^{\infty} \lvert h(t) \rvert dt = \int_{0}^{\infty} [1 - e^{-t}] dt = \int_{0}^{\infty} dt - \int_{0}^{\infty} e^{-t} dt = \infty - 1 = \infty$

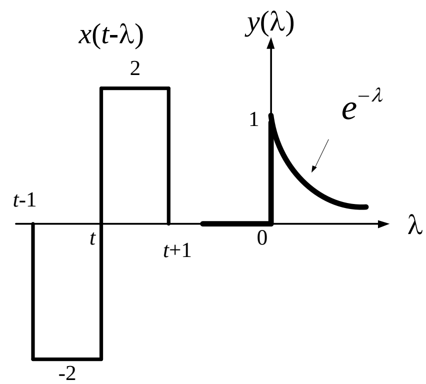
Q2 Let *x*(t) and y(t) be as shown below:



Evaluate convolution integral *x*(t)*y(t) ?

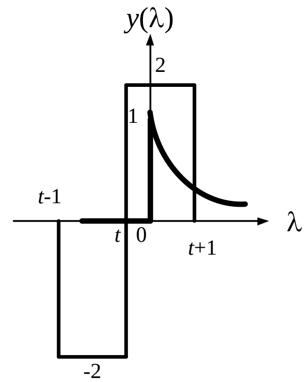
$$x(t)*y(t)=\int_{-\infty}^{\infty} \underbrace{y(\lambda)}_{fix}\,\underbrace{x(t-\lambda)}_{moving}dt$$





$t<-1 \Rightarrow x(t)*y(t)=0$ (No overlapping)

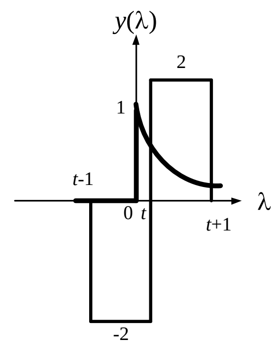
$$-1 < t < 0 \;\Rightarrow x(t) * y(t) = \int_{0}^{t+1} (2)(e^{-\lambda})d\lambda \;= 2(1 - e^{-(t+1)})$$



$$0 < t < 1 \;\Rightarrow x(t) * y(t) = \int_{0}^{t} (-2)(e^{-\lambda})d\lambda \;+\; \int_{t}^{t+1} (2)(e^{-\lambda})d\lambda$$

$$= 2(e^{-t} - 1) \;+ 2e^{-t}(1 - e^{-1})$$

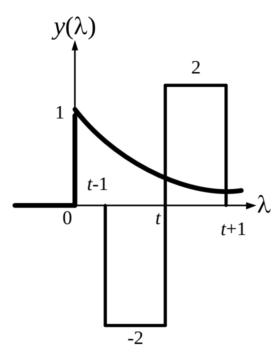
$$= 3.3\, e^{-t} - 2$$



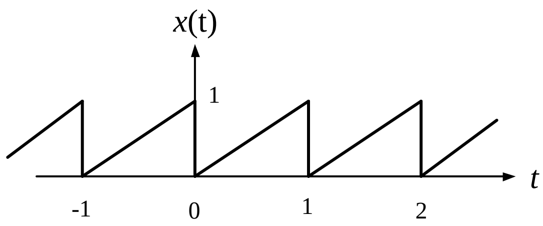
$$t > 1 \;\Rightarrow x(t) * y(t) = \int_{t-1}^{t} (-2)(e^{-\lambda})d\lambda \;+\; \int_{t}^{t+1} (2)(e^{-\lambda})d\lambda$$

$$= 2e^{-t}(1 - e^{-1}) \;- 2e^{-t}(e^{1} - 1)$$

$$= \;-2.17\, e^{-t}$$



Q3 Let *x*(t) be a periodical signal as shown below:



Find the Fourier Series complex coefficients X_n ?

$$T_o = 1 \Rightarrow \omega_o = \frac{2\pi}{1} = 2\pi$$

$$X_o = \frac{1}{T_o}\int_{T_o} x(t)dt = \frac{1}{1}\int_0^1 tdt = \frac{1}{2}$$

$$X_n = \int_{T_o} x(t)e^{-jn\omega_o t}dt = \int_0^1 (t)e^{-jn(2\pi)t}dt = j\,\frac{1}{2\pi n}$$