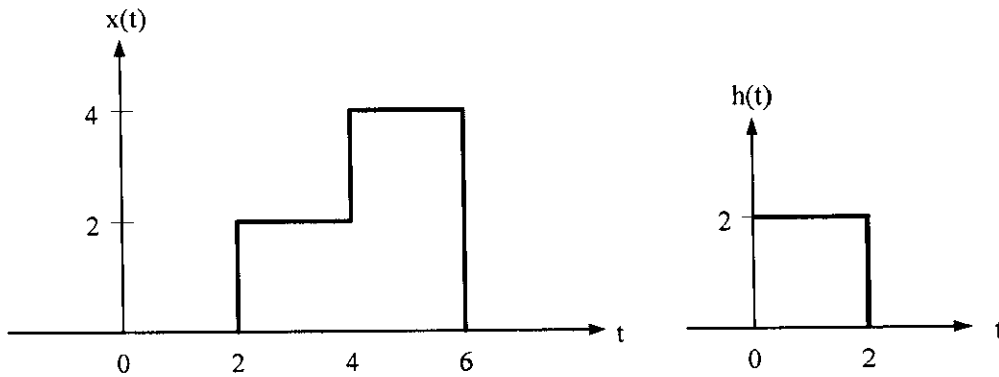


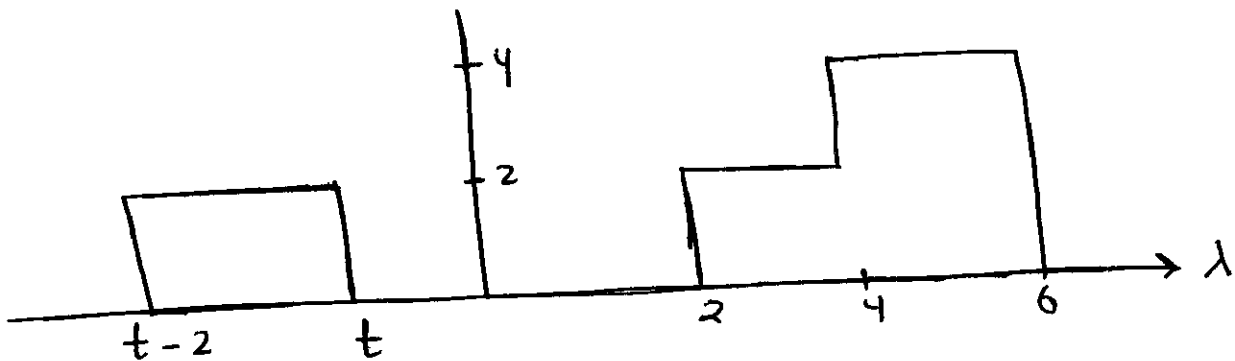
EE 207 – Fall 2009  
Quiz 2

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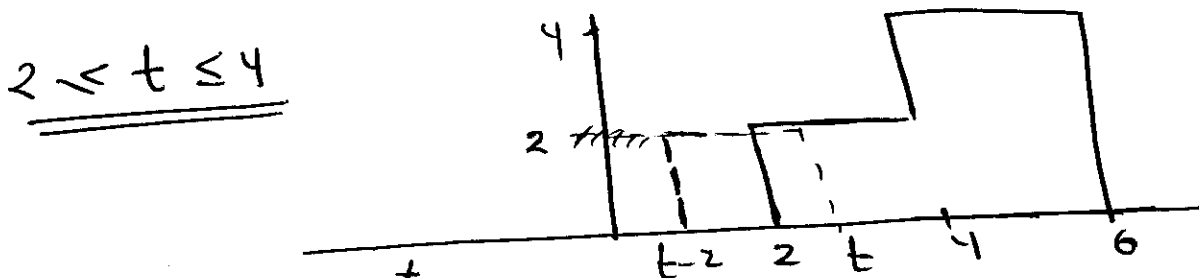


For the signals  $x(t)$  and  $h(t)$  shown above, evaluate the convolution integral  $x(t)*h(t)$ ?

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} x(\lambda) h(t-\lambda) d\lambda$$

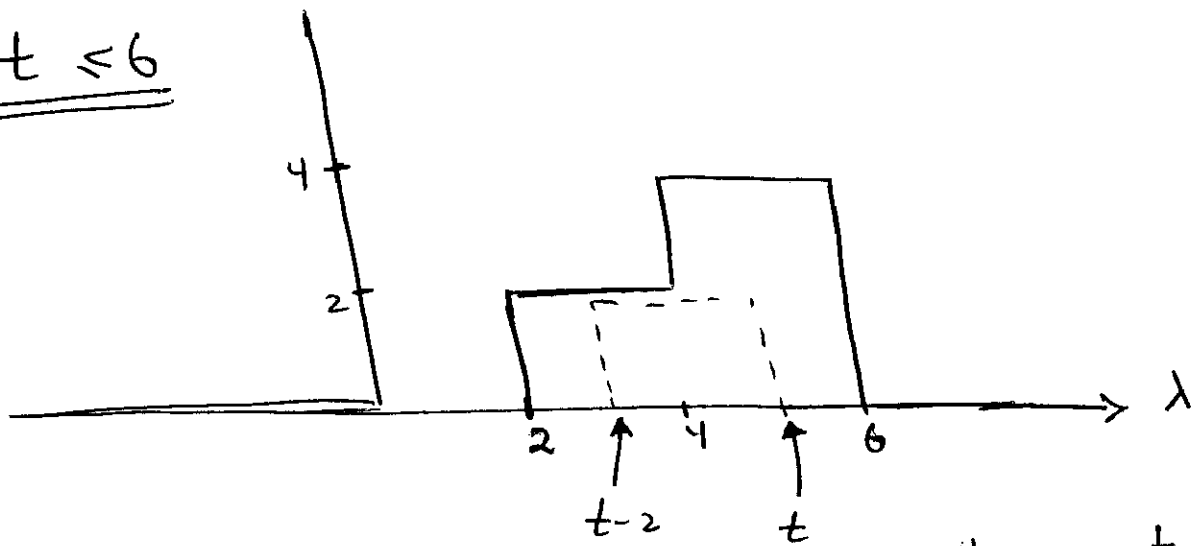


$t \leq 2$   $y(t) = 0$  (No overlapping)



$$y(t) = \int_2^t (2)(2) d\lambda = 4\lambda \Big|_2^t = \boxed{4t - 8}$$

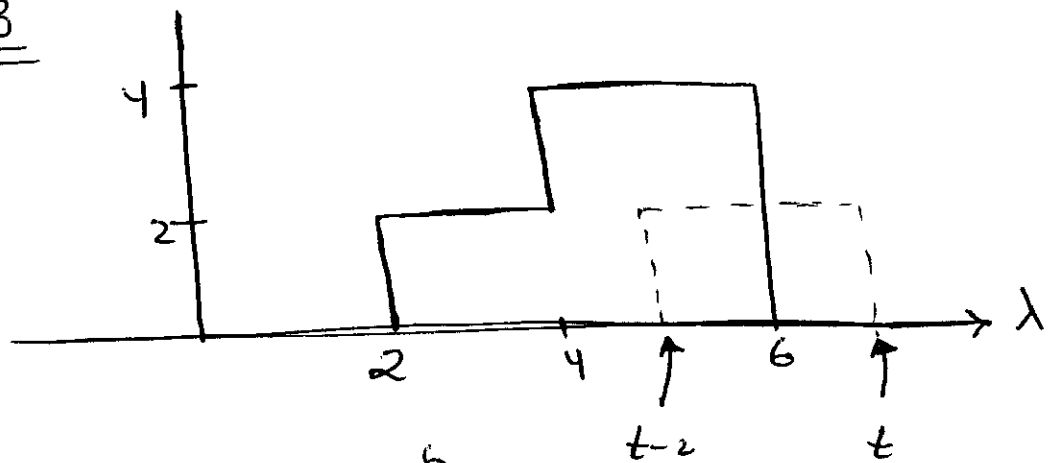
$$\underline{\underline{4 \leq t \leq 6}}$$



$$y(t) = \int_{t-2}^4 (2)(2) d\lambda + \int_4^t (4)(2) d\lambda = 4\lambda \Big|_{t-2}^4 + 8\lambda \Big|_4^t$$

$$\Rightarrow \boxed{y(t) = 4t - 8}$$

$$\underline{\underline{6 \leq t \leq 8}}$$



$$y(t) = \int_{t-2}^6 (4)(2) d\lambda = 8\lambda \Big|_{t-2}^6 = \boxed{64 - 8t}$$

$$t-2 \geq 6 \text{ or } t \geq 8 \quad y(t) = 0 \quad (\text{No overlapping})$$

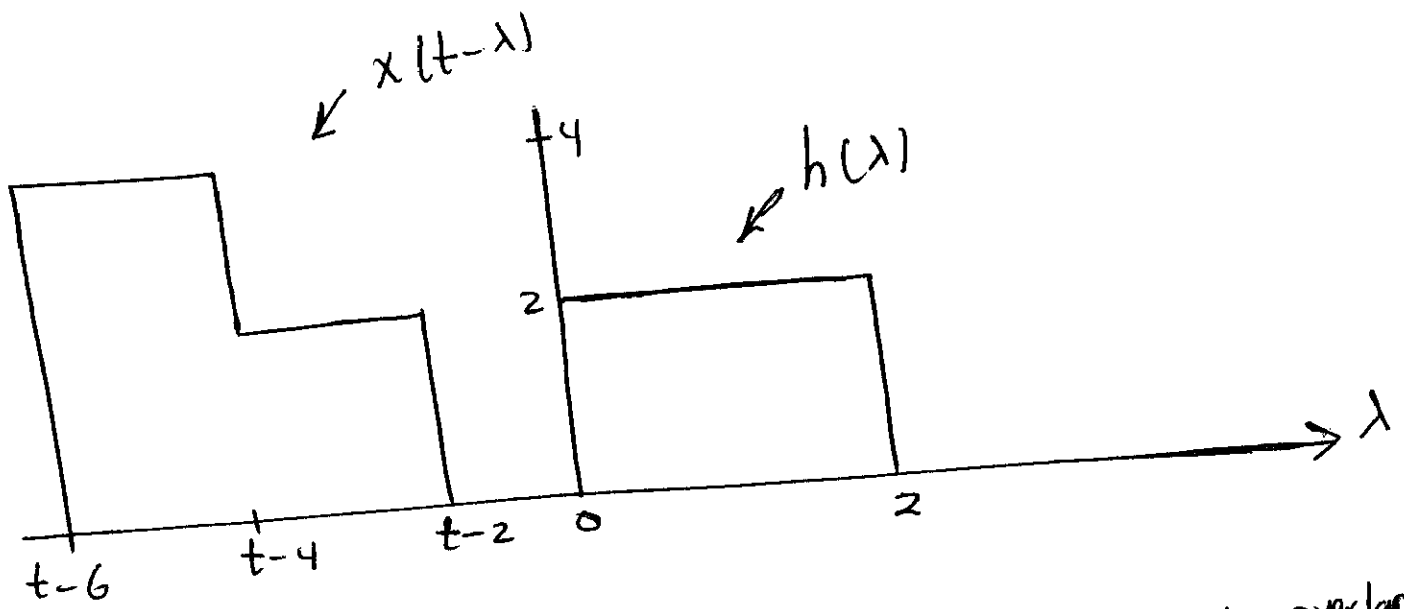
$$y(t) = x(t) * h(t) = \begin{cases} 0 & t \leq 2 \\ 4t-8 & 2 \leq t \leq 4 \\ 4t-8 & 4 \leq t \leq 6 \\ 64-8t & 6 \leq t \leq 8 \\ 0 & t \geq 8 \end{cases}$$

Another solution

$$y(t) = h(t) * x(t) = \int_{-\omega}^{\omega} h(\tau) x(t-\tau) d\tau$$

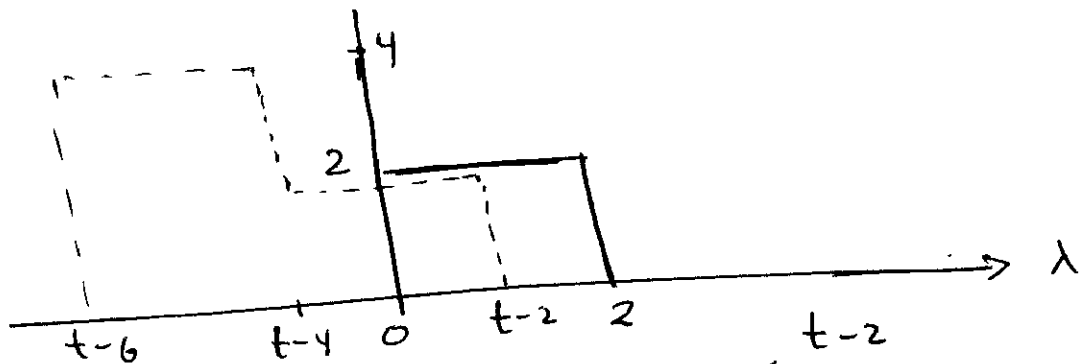
Continue  $\Rightarrow$

$$y(t) = h(t) * x(t) = \int_{-\infty}^{\infty} h(\lambda) x(t-\lambda) d\lambda$$



$$t-2 \leq \Rightarrow t \leq 2$$

$y(t) = 0$  (No overlapping)

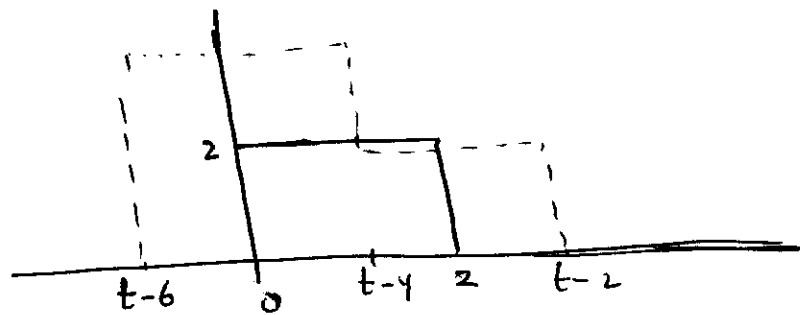


$$\underline{0 \leq t-2 \leq 2 \Rightarrow 2 \leq t \leq 4}$$

$$y(t) = \int_0^{t-2} (2)(2) d\lambda = \boxed{4t-8}$$

$$\underline{2 \leq t-2 \leq 4}$$

$$\underline{4 \leq t \leq 6}$$



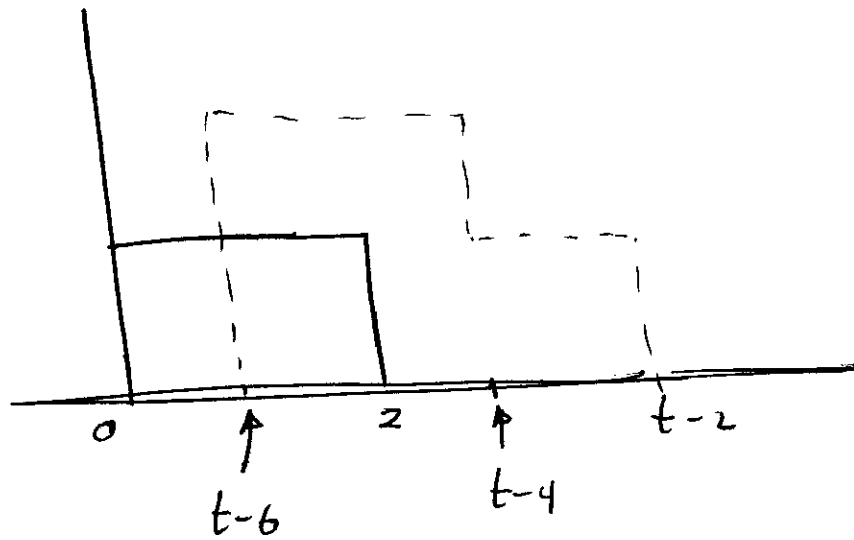
$$y(t) = \int_0^{t-4} (2)(4) d\lambda + \int_{t-4}^2 (2)(2) d\lambda = \boxed{4t-8}$$

$$4 < t-2 \leq 6$$

$$\underline{\underline{6 < t \leq 8}}$$

OR

$$0 < t-6 \leq 2 \Rightarrow \underline{\underline{6 \leq t \leq 8}}$$



$$y(t) = \int_{t-6}^2 (2)(4) d\lambda = 8\lambda \Big|_{t-6}^2 = 64 - 8t$$

$$\underline{\underline{t-6 \geq 6 \Rightarrow t \geq 8}}$$

$$y(t) = 0 \quad (\text{No overlapping})$$