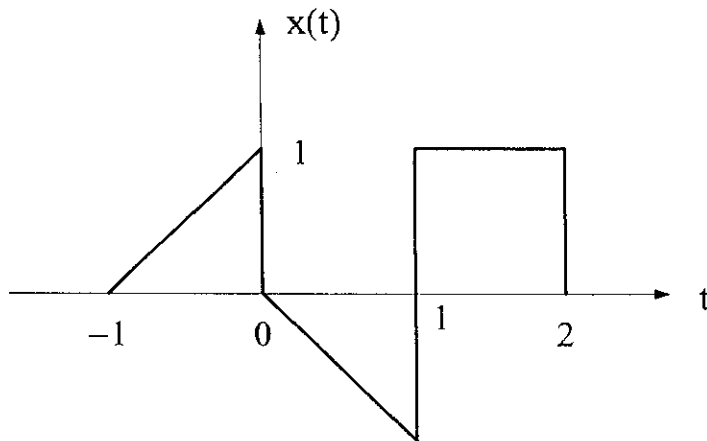


EE 207-01 – Winter 2010
Quiz 1

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For the signal $x(t)$ shown above :

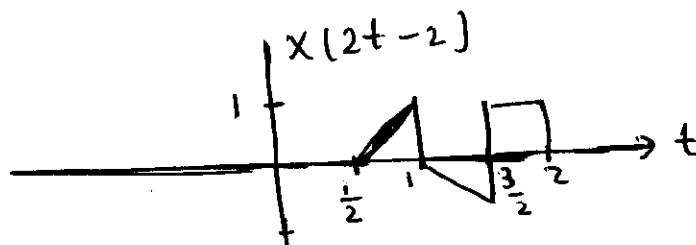
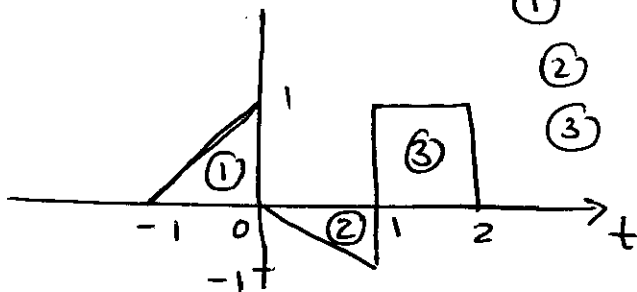
- (a) Express $x(t)$ in terms of the singularities functions ?
 (b) Plot $x(2t-2)$? *show all significant points*

Solution

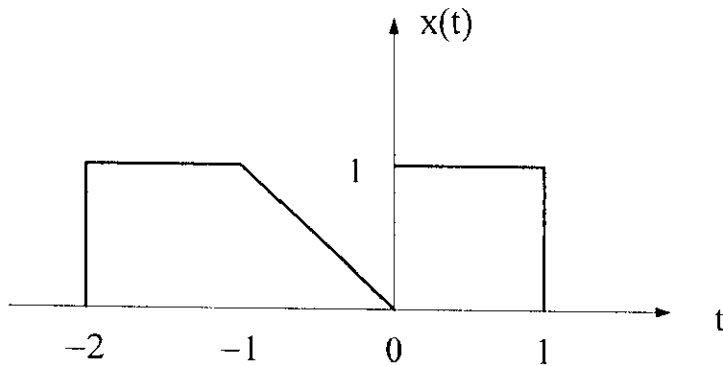
(a) $x(t) = r(t+1) - 2r(t) - u(t) + r(t-1) + 2u(t-1) - u(t-2)$

(b)

- ① $-1 < 2t-2 < 0 \Rightarrow \frac{1}{2} < t < 1$
- ② $0 < 2t-2 < 1 \Rightarrow 1 < t < \frac{3}{2}$
- ③ $1 < 2t-2 < 2 \Rightarrow \frac{3}{2} < t < 2$



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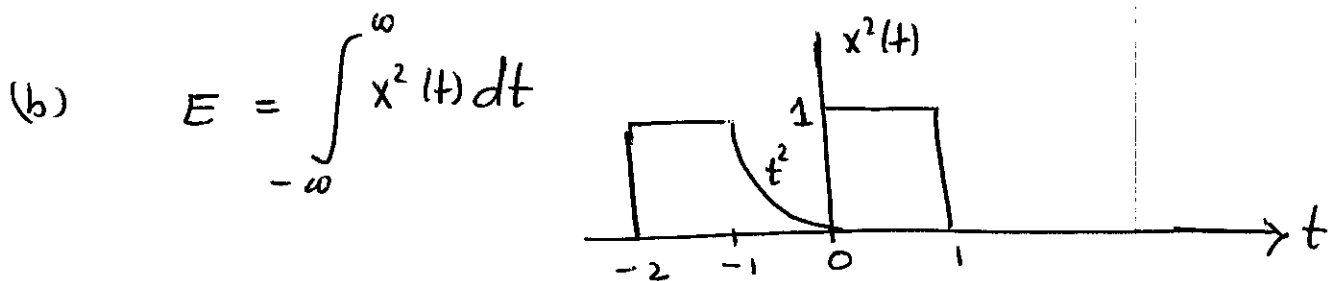
For the signal $x(t)$ shown above :

(a) Express $x(t)$ in terms of the singularities functions ?

(b) Is $x(t)$ a power or an Energy signal ? *Explain*

Solution

$$(a) \quad x(t) = u(t+2) - r(t+1) + r(t) + u(t) - u(t-1)$$

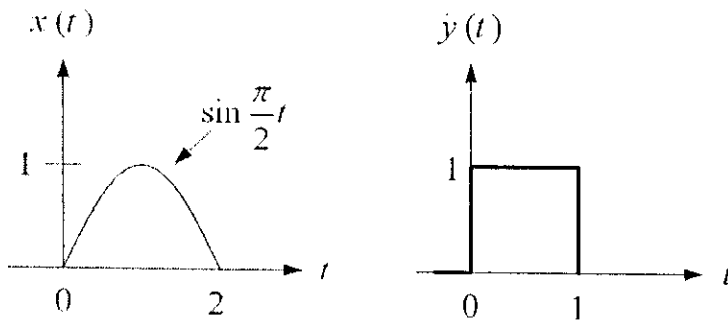


$$E = \int_{-2}^{-1} (1) dt + \int_{-1}^0 t^2 dt + \int_0^1 (1) dt$$

$$= (1)(1) + \left. \frac{t^3}{3} \right|_{-1}^0 + (1)(1) = \frac{7}{3} < \infty$$

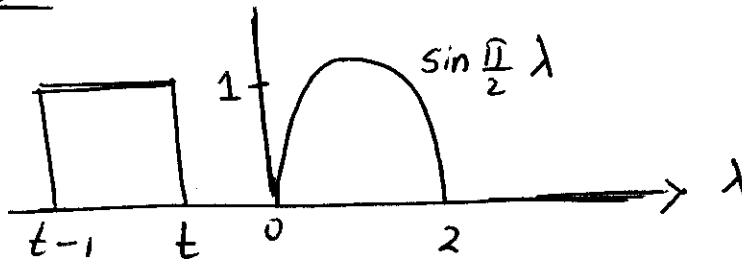
\Rightarrow Energy signal

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

Solution



$t < 0$ $x(t) * y(t) = 0$ (No overlapping)

$0 < t < 1$

Diagram for $0 < t < 1$: The rectangular pulse starts at $t-1$ and ends at t . The sine wave starts at 0 and ends at 2. The overlap is from $t-1$ to t .

$$\int_0^t \sin \frac{\pi}{2} \lambda (1) d\lambda = \frac{2}{\pi} [1 - \cos \frac{\pi}{2} t]$$

$1 < t < 2$

Diagram for $1 < t < 2$: The rectangular pulse starts at $t-1$ and ends at t . The sine wave starts at 0 and ends at 2. The overlap is from $t-1$ to 2.

$$\int_{t-1}^2 \sin \frac{\pi}{2} \lambda (1) d\lambda = \frac{2}{\pi} [\cos \frac{\pi}{2} (t-1) - \cos \frac{\pi}{2} t]$$

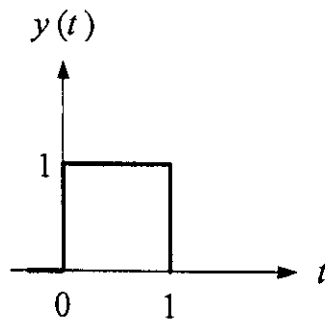
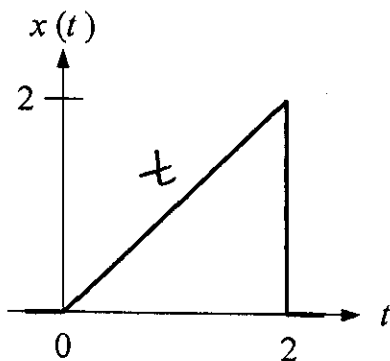
$2 < t < 3$

Diagram for $2 < t < 3$: The rectangular pulse starts at $t-1$ and ends at t . The sine wave starts at 0 and ends at 2. The overlap is from 0 to 2.

$$\int_{t-1}^2 \sin \frac{\pi}{2} \lambda d\lambda = \frac{2}{\pi} [\cos \frac{\pi}{2} (t-1) + 1]$$

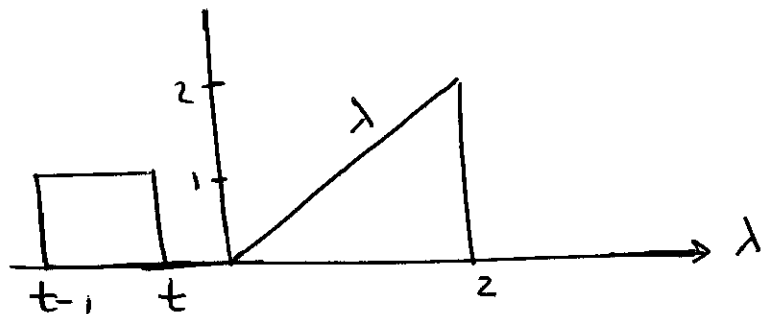
$t > 3$ $x(t) * y(t) = 0$ (No overlapping)

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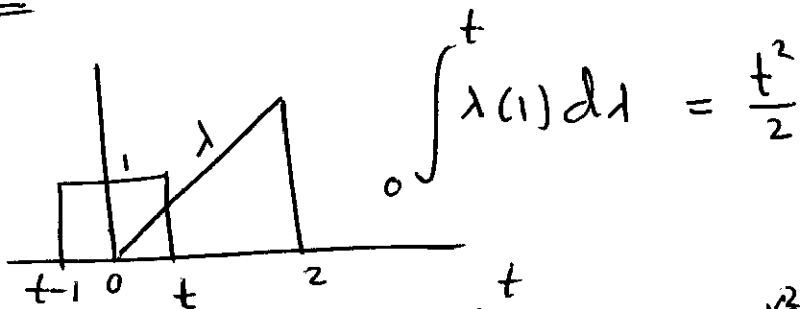


For the signals $x(t)$ and $y(t)$ shown above, evaluate the convolution $x(t) * y(t)$

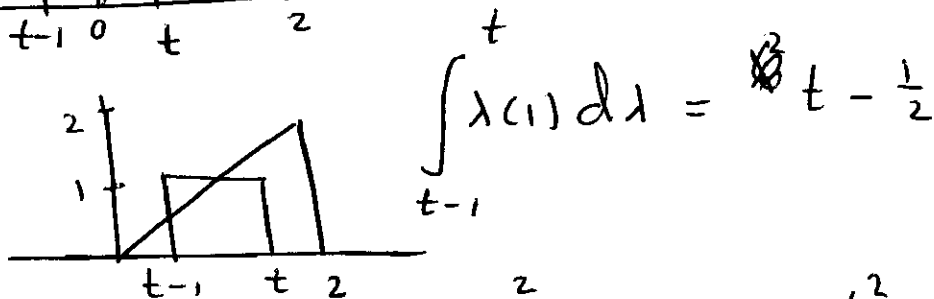
Solution



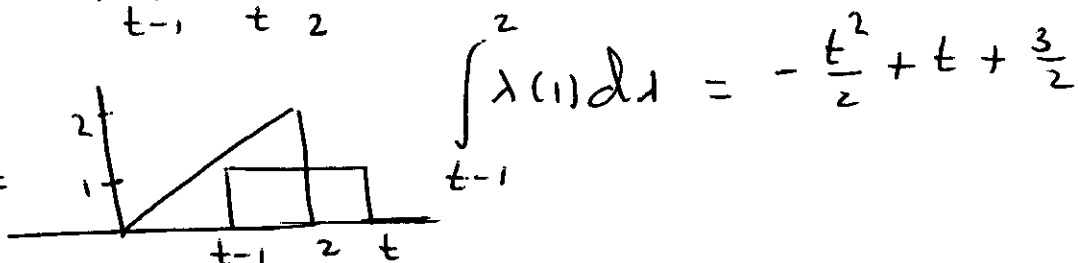
$t < 0$ $x(t) * y(t) = 0$ (No overlapping)



$1 < t < 2$



$2 < t < 3$



$t > 3$ $x(t) * y(t) = 0$ (No overlapping)