

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box.
Erase thoroughly. Scan at 150 dpi to "<Problem Type Acronym>.gif"

CBE 1

Problem Type Acronym

Question

$$x(t) = 2e^{2t}$$

$$y(t) = \delta(t+2)$$

$$x(t) * y(t) = ?$$

Answer

$$\begin{aligned}x(t) * y(t) &= y(t) * x(t) = \int_{-\infty}^{+\infty} y(\tau) x(t-\tau) d\tau \\&= \int_{-\infty}^{+\infty} \delta(\tau+2) 2e^{2(t-\tau)} d\tau \\&\quad \text{↑} \\&\quad \text{fires at } \tau = -2, \text{"sifting"} \\&= 2e^{2(t+2)}\end{aligned}$$

Question

$$x(t) = u(t)e^{-2t}$$

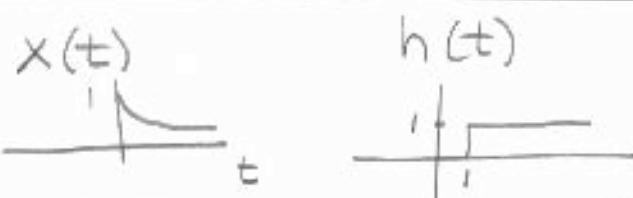
$$h(t) = u(t-1)$$

$$x(t) * h(t) = y(t)$$

graph $x(t)$ and $h(t)$

solve $y(t)$ by equation

Answer



$$y(t) = \int_{-\infty}^{+\infty} x(z) h(t-z) dz$$

$$y(t) = \int_{-\infty}^{+\infty} u(z) e^{-2z} u(t-z-1) dz \quad \text{fires at } t-1$$

$$= \int_0^{t-1} e^{-2z} dz = -\frac{1}{2} e^{-2z} \Big|_0^{t-1} = \frac{1}{2} [1 - e^{-2(t-1)}]$$

$$y(t) = u(t) \frac{1}{2} [1 - e^{-2(t-1)}] \quad \text{therefore} \quad \begin{cases} \text{for } t \geq 1 \\ \text{integration is valid.} \end{cases}$$

$$y(t) = 0 \text{ for } t < 1$$

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CBE3
Problem Type Acronym

Name

ID #

Question

$$x(t) = -u(t) \cos(t)$$

$$h(t) = \delta(t-\pi)$$

Solve for $y(t) = x(t) * h(t)$

mathematically,

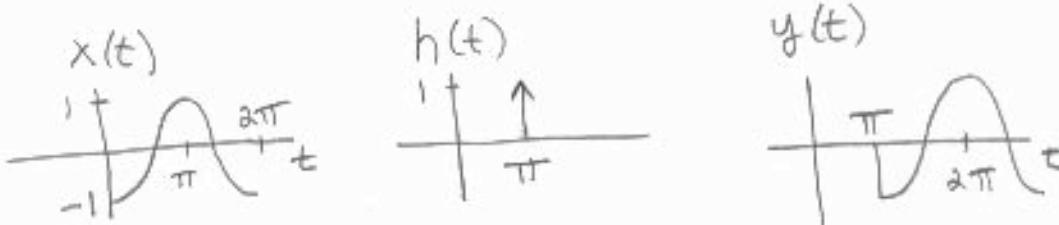
Then graph $x(t)$, $h(t)$, and $y(t)$
label all axes

Answer

$$y(t) = \int_{-\infty}^{+\infty} -u(\tau) \cos(\tau) \delta(t-\pi-\tau) d\tau$$

↑
fires at $\tau = t-\pi$

$$= -u(t-\pi) \cos(t-\pi)$$



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C&E 4

Problem Type Acronym

Name

ID #

Question

$$x(t) = -u(t)$$

$$h(t) = u(t) 6t$$

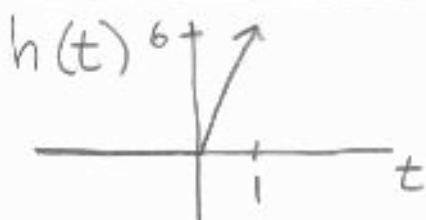
graph $x(t)$ and $h(t)$

Solve $y(t) = x(t) * h(t)$

mathematically

Then solve it graphically
and compare.

Answer



$$y(t) = \int_{-\infty}^t x(z)h(t-z)dz = -6 \int_{-\infty}^t u(z)u(t-z)z dz$$

$$= -6 \int_0^t z dz = -3t^2$$

↑
for $t > 0$

otherwise $y = 0$

