Le11

Friday, 21 March 2025 10:28

ES 1 RICONOSCERE SE LE SEGUENTI ESPRESSIONI SONO CONVOLUZIONI E IN CASO AFFERMATIVO QUALI SIANO I SEGNALI $x(t)$ E $y(t)$

$$z(t) = \int_{-\infty}^{+\infty} e^{-|u|} \sin(t-u)\, du$$

$$\stackrel{?}{=} x * y(t) = \int_{-\infty}^{+\infty} x(u)\, y(t-u)\, du$$

$$x(t) = e^{-|t|}$$
$$y(t) = \sin(t)$$

ES 2

$$z(t) = \int_{-\infty}^{+\infty} e^{t-u} \sin(u+2)\, 1(u)\, du$$

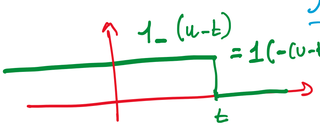
$$\stackrel{?}{=} x * y(t) = \int_{-\infty}^{+\infty} x(u)\, y(t-u)\, du$$

$$x(t) = \sin(t+2)\cdot 1(t)$$
$$y(t) = e^{t}$$

ES 3

$$z(t) = \int_{-\infty}^{t} e^{u} \sin(t-u+2)\, 1(t-u)\, du$$

$$\stackrel{?}{=} \int_{-\infty}^{+\infty} x(u)\, y(t-u)\, du$$

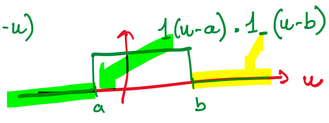


ATTIVO PER $t-u>0$ ovvero $t>u$

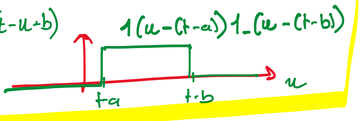
$$x(t) = e^{t}$$
$$y(t) = \sin(t+2)\cdot 1(t)$$

NOTA

$$\int_{-\infty}^{b} \ldots\, 1(u-a)\,1(b-u)\, du$$



$$\int_{t-a}^{t+b} \ldots\, 1(u-t+a)\,1(t-u+b)\, du$$



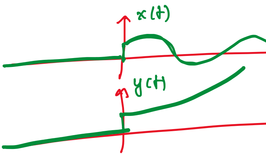
ES 4

$$z(t) = \begin{cases} 0 & t \le 0 \\ \int_{-\infty}^{t} e^{t-u}\, 1(t-u) \sin(u+2)\, 1(u)\, du & t > 0 \end{cases}$$

$$x(t) = \sin(t+2)\,1(t)$$
$$y(t) = e^{t}\,1(t)$$

$$z(t) = \begin{cases} 0 & t \le 0 \\ x*y(t) & t > 0 \end{cases}$$

$$= x*y(t)\cdot 1(t)$$



$c(x) = [0, +\infty)$

$c(y) = [0, +\infty)$

$c(x*y) = [0+0, +\infty+\infty) = [0, +\infty)$

ES 5

$$z(n) = \sum_{k=-\infty}^{n-1} 1_0(n-k-1)\, 3^{k} \stackrel{?}{=} \sum_{k=-\infty}^{+\infty} x(k)\, y(n-k)$$

$$1_0(k-(n-1)) = 1_0(n-1-k)$$

$$x(n) = 3^{n}$$
$$y(n) = 1_0(n-1)$$