

EX: Find the values of the following expressions:

a)  $\int_{-1}^1 \delta(t) dt$

b)  $\int_{-\infty}^{\infty} t^2 \delta(t-2) dt$

c)  $f(t) = \begin{cases} 0 & t \leq -1 \\ \int_{-1}^t \tau^2 \delta(\tau-2) d\tau & t > -1 \end{cases}$

d)  $\int_{-\infty}^{\infty} \delta(t/2) dt$

e)  $\int_{-\infty}^t \left( \int_{-\infty}^T 2\delta(\tau) d\tau \right) dT$

SOL'N: a)

$$\int_{-1}^1 \delta(t) dt = 1$$

SOL'N: b)

$$\int_{-\infty}^{\infty} t^2 \delta(t-2) dt = t^2 \Big|_{t=2} = 4$$

SOL'N: c)

$$f(t) = \begin{cases} 0 & t \leq -1 \\ \int_{-1}^t \tau^2 \delta(\tau-2) d\tau & t > -1 \end{cases} = 4u(t-2)$$

SOL'N: d)

$$\int_{-\infty}^{\infty} \delta(t/2) dt = \int_{-\infty}^{\infty} \delta(\tau) 2 d\tau = 2 \int_{-\infty}^{\infty} \delta(\tau) d\tau = 2$$

SOL'N: e)

$$\int_{-\infty}^t \left( \int_{-\infty}^T 2\delta(\tau) d\tau \right) dT = \int_{-\infty}^t (2u(T)) dT = 2tu(t)$$