

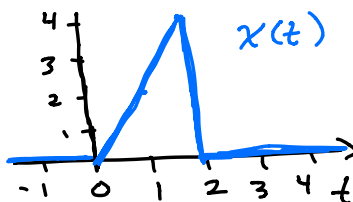
Example 1.4: Find the energies of the following signals.

$$(a) \quad x(t) = \begin{cases} 2t, & 0 \leq t \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

$$(b) \quad x(t) = e^{-t}u(t+1)$$

Solution:

(a) We have



Note that we can express $x(t)$ as

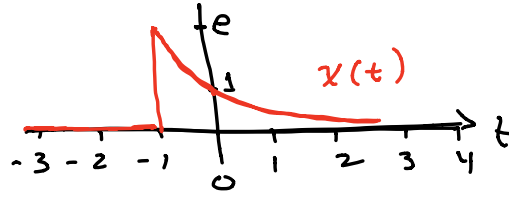
$$x(t) = 2r(t) - 2r(t-2) - 4u(t-2). \quad (\text{E1})$$

Using the energy definition,

$$E = \int_{-\infty}^{\infty} |x(t)|^2 dt = \int_0^2 |2t|^2 dt = \int_0^2 4t^2 dt = \frac{32}{3}. \quad (\text{E2})$$

$x(t)$ is an energy signal.

(b) We have



$$\begin{aligned}
 E &= \int_{-\infty}^{\infty} |x(t)|^2 dt = \int_{-1}^{\infty} e^{-2t} dt = \left[-\frac{1}{2} e^{-2t} \right]_{-1}^{\infty} \quad (\text{E3}) \\
 &= -\frac{1}{2}(0 - e^2) = \frac{e^2}{2}.
 \end{aligned}$$