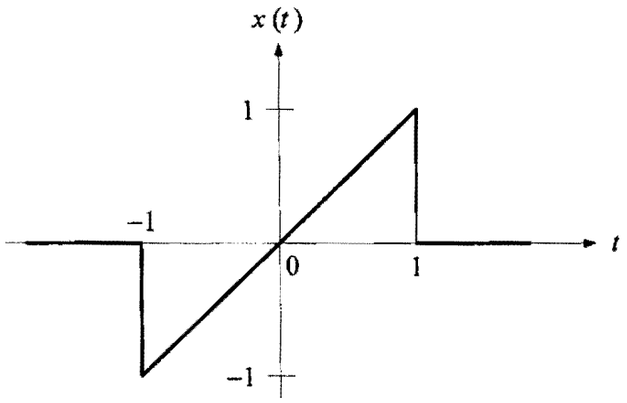
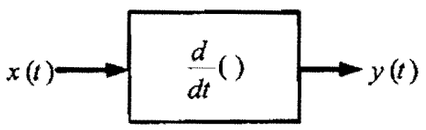
EE 207-03- – Winter 2012(112)
Quiz 4

SER	ID	NAME





The input signal x(t) and output signal y(t) shown above ,

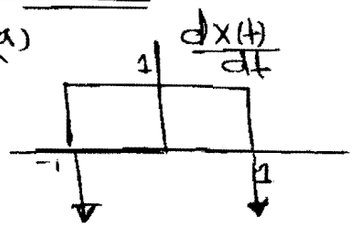
(a) Using the Fourier Transform Properties and Table find the Fourier Transform input signal X(ω) ?

(b) Find the transfer function H(ω) ?

(c) Using the Fourier Transform Properties and Table find the output signal y(t) ?

Solution

(a) $\frac{dx(t)}{dt}$



$= \text{rect}(t/2) - [\delta(t+1) + \delta(t-1)]$

$\Rightarrow (jw)X(f) = 2\,\text{sinc}(w) - [e^{jw} + e^{-jw}]$

$= 2\,\text{sinc}(w) - 2\cos(w)$

$\Rightarrow X(f) = \frac{2\,\text{sinc}(w) - 2\cos(w)}{jw}$

(b) $y(t) = \frac{dx(t)}{dt} \Rightarrow Y(w) = (jw)X(w) \Rightarrow \frac{Y(w)}{X(w)} = jw$

(e) $Y(\omega) = H(\omega)\, X(\omega)$

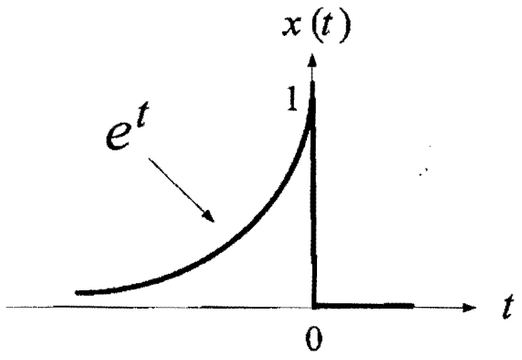
$$= (j\omega)\ \frac{2\,\mathrm{sinc}(\omega) - 2\,\mathrm{Cs}(\omega)}{j\omega}$$

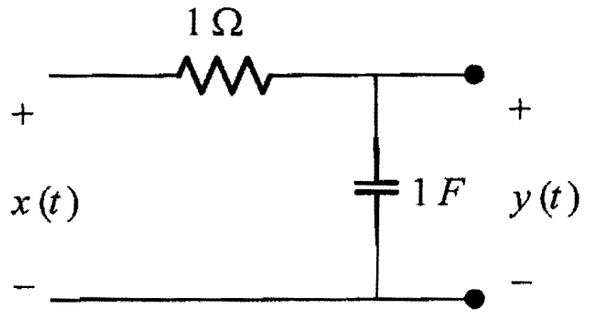
$$= 2\,\mathrm{sinc}(\omega) - 2\,\mathrm{Cs}(\omega)$$

$$\Rightarrow y(t) = \mathrm{rect}(t/2) - [\delta(t+1) + \delta(t-1)]$$

EE 207-03-06 – Winter 2012(112)
Quiz 4

SER	ID	NAME KEY





The input signal x(t) and output signal y(t) shown above ,

(a) Find the Fourier Transform input signal X(ω) ?

(b) The transfer function H(ω) ?

(c) The output signal y(t) ?

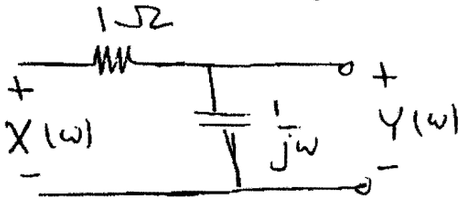
Solution

(a) $X(w) = \int_{-\infty}^{0} e^{t} \cdot e^{-jwt}\, dt = \int_{-\infty}^{0} e^{(1-jw)t}\, dt$

$= \frac{1}{1-jw} e^{(1-jw)t}\Big|_{-\infty}^{0} = \frac{1}{1-jw}\left[e^{0} - e^{-\infty}\right]$

$= \frac{1}{1-jw}$

(b)



$H(w) = \frac{1}{1+jw}$

$Y(w) = \frac{1/jw}{1 + \frac{1}{jw}} X(w)$

$H(w) = \frac{1}{1+jw}$

$$Y(\omega) = H(\omega)X(\omega)$$

$$= \left(\frac{1}{1+j\omega}\right)\left(\frac{1}{1-j\omega}\right) = \frac{1}{1+\omega^2}$$

From Table 5.2

$$e^{-a|t|} \quad a > 0 \quad \leftrightarrow \quad \frac{2a}{a^2+\omega^2}$$

$$\Rightarrow \quad y(t) = \frac{1}{2}e^{-|t|}$$