GABARITO PCOM 1ºEE 2016.1

1º

$$x(t) = \begin{cases} -1, & -2 \le t \le -1 \\ t, & -1 \le t \le 1 \\ 1, & 1 \le t \le 3 \end{cases}$$

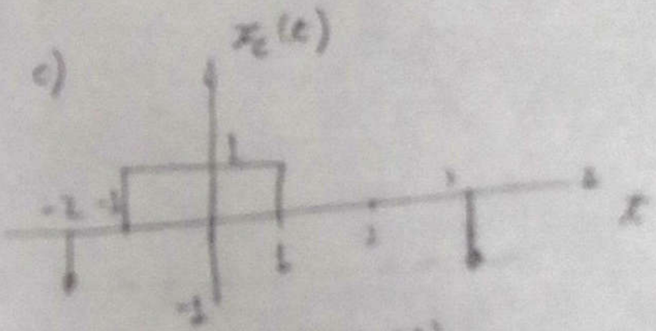
a)
$$x(-4t) = \begin{cases} 1, & -\frac{3}{4} \le t \le -\frac{1}{4} \\ -4t, & -\frac{1}{4} \le t \le \frac{1}{4} \\ -1, & \frac{1}{4} \le t \le \frac{3}{4} \end{cases} \qquad x(2-4t) = \begin{cases} 1, & -\frac{11}{4} \le t \le -\frac{5}{4} \\ -4t-8, & -\frac{5}{4} \le t \le -\frac{3}{4} \\ -1, & -\frac{3}{4} \le t \le -\frac{5}{4} \end{cases}$$

b)
$$x(-t) = \begin{cases} 1, & -3 \le t \le -2 \\ 1, & -2 \le t \le -1 \\ -t, & -1 \le t \le 1 \\ -1, & 1 \le t \le 2 \end{cases} \Rightarrow x(t) + x(t) = \begin{cases} 1, & -3 \le t \le -2 \\ 1, & 2 \le t \le 3 \end{cases}$$

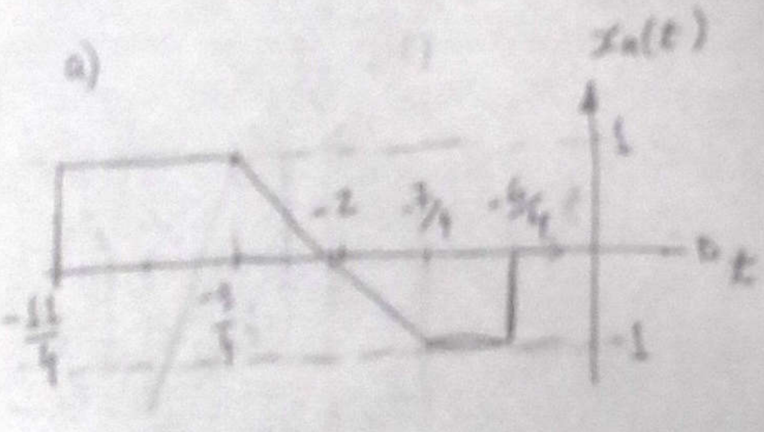
$$[x(t) + x(-t)]\, u(t) = \begin{cases} 1, & 2 \le t \le 3 \\ 0, & cc \end{cases}$$

c)
$$\frac{d}{dt} x(t) = \begin{cases} 0, & t < -2 \\ -1, & t = \{-2, 3\} \\ 1, & -1 \le t \le 1 \\ 0, & t > 3 \end{cases}$$

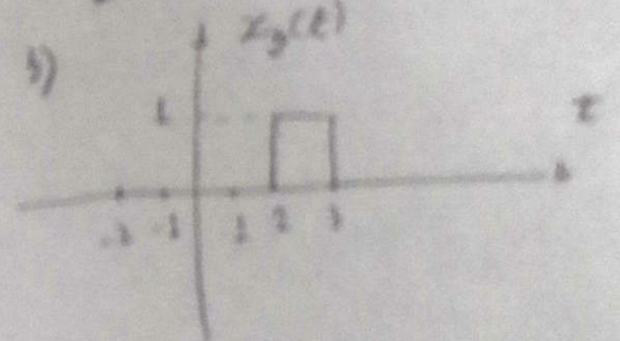
c)



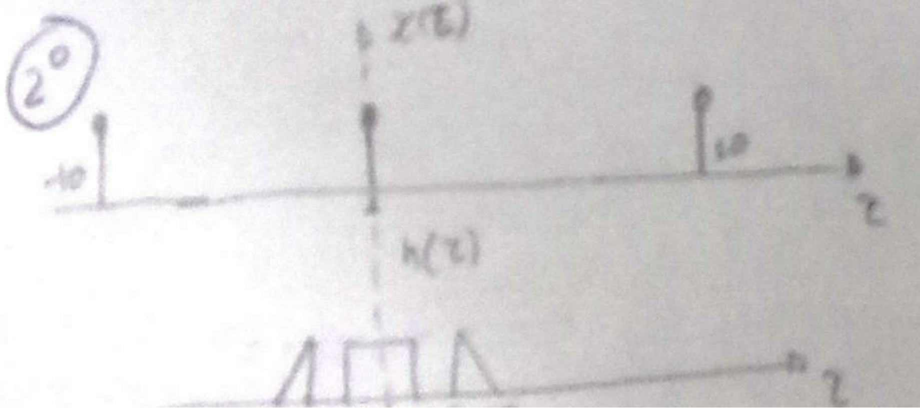
a)



b)



2º



Continua na folha III...

③ $x(t) = \sum_{k=-\infty}^{\infty} a_k e^{j\frac{2\pi}{T}kt}$

$a_0 = \frac{1}{T}\left(\int_0^{T/4} dt - \int_{-T/4}^{0} dt\right) = \frac{1}{T}\left(t\Big|_0^{T/4} - t\Big|_{-T/4}^{0}\right) = \frac{1}{T}\left(\frac{T}{4} - \frac{T}{4}\right) = 0$

$a_k = \frac{1}{T}\int_0^{T/4} e^{-j\frac{2\pi}{T}kt} dt - \frac{1}{T}\int_{-T/4}^{0} e^{-j\frac{2\pi}{T}kt} dt$

$a_k = \frac{1}{T}\left(\frac{-1}{j\frac{2\pi}{T}k} e^{-j\frac{2\pi}{T}kt}\Big|_0^{T/4} - \frac{-1}{j\frac{2\pi}{T}k} e^{-j\frac{2\pi}{T}kt}\Big|_{-T/4}^{0}\right)$

$a_k = \frac{1}{T} \cdot \frac{T}{j2\pi k}\left(-e^{-j\frac{\pi}{2}k} + 1 + 1 - e^{j\frac{\pi}{2}k}\right) = \frac{1}{j\pi k}\left(\frac{2}{2} - \frac{(e^{j\frac{\pi}{2}k} + e^{-j\frac{\pi}{2}k})}{2}\right)$

$a_k = \frac{1}{j\pi k}\left(1 - \cos(\frac{\pi}{2}k)\right)$

$a_1 = -\frac{j}{\pi}(1-0) = \frac{-j}{\pi}$ $\quad a_{-1} = \frac{j}{\pi}$

$a_2 = -\frac{j}{2\pi}(1+1) = -\frac{j}{\pi}$ $\quad a_{-2} = \frac{j}{\pi}$

$a_3 = -\frac{j}{3\pi}(1-0) = -\frac{j}{3\pi}$ $\quad a_{-3} = \frac{j}{3\pi}$

b) simetria ímpar
puramente imaginário.

④ $x(t) = \Pi(2t) * \Pi(2t)$

$\tau = \frac{1}{2}$ $\quad T_1 = \frac{1}{4}$

$\Pi(\frac{t}{T_1}) \longleftrightarrow 2\frac{\sin(wT_1)}{w} = 2 \cdot T_1 \operatorname{Sinc}(wT_1)$

$\Pi(2t) \longleftrightarrow 2 \cdot \frac{1}{2} \operatorname{sinc}(\frac{w}{4}) = \operatorname{sinc}(\frac{w}{4})$

$X(w) = \operatorname{sinc}(\frac{w}{4}) \cdot \operatorname{sinc}((\frac{w}{4}) = \operatorname{sinc}^2(\frac{w}{4})$

⑤ $x(t) = \operatorname{sgn}(t) * \frac{d^2}{dt^2}\operatorname{sgn}(t) * (\delta(\cdots)$

$X(w) = \frac{2}{jw} \cdot (jw)^2 \cdot \frac{2}{jw} \cdot (e^{-j4w} + e^{j4w}) = 8 \cdot \cos(4w)$

ntinuação da 2ª questão