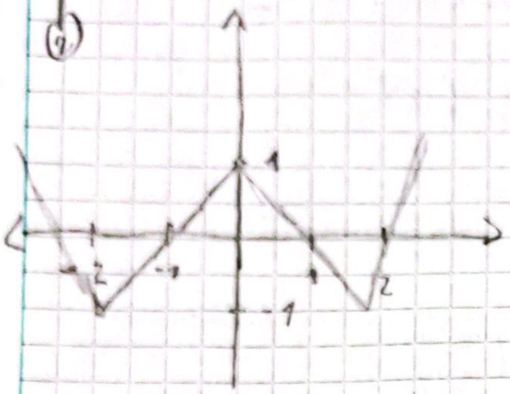
Parcial 2

1)



$$x_0 = \frac{1}{T}\int_T x(t)\,dt$$

$$x_0 = \frac{1}{4}\int_{-2}^{0} t+1\,dt + \int_{0}^{2} -t+1\,dt$$

$$x_0 = \frac{1}{4}\left[\frac{t^2}{2}\Big|_{-2}^{0} + t\Big|_{-2}^{0} + \frac{-t^2}{2}\Big|_{0}^{2} + t\Big|_{0}^{2}\right.$$

$$x_0 = \frac{1}{4}\left[0-[2]\right] + \left[0-(-2)\right] + \left[-2\right] + \left[2\right]$$

$$\frac{1}{4} \quad -2 \quad +2 \quad -2+2 = 0 \cdot \frac{1}{4} = 0$$

$$a_n = \frac{2}{T}\int_T x(t)\cos(nw_0t) \Rightarrow \frac{2}{T}\int_{-2}^{0} t+1\cos(nw_0t) + \int_{0}^{2} -t+1\cos(nw_0t)$$

$$\frac{2}{4} = \frac{1}{2}\left[\int_{-2}^{0} t\cos(nw_0t) + \int_{-2}^{0}\cos(nw_0t) + \int_{0}^{2} -t\cos(nw_0t) + \int_{0}^{2}\cos nw_0t\right]$$

$$\frac{1}{2}\left[\left(t\frac{\sin(nw_0t)}{nw_0}\Big|_{-2}^{0} - \int_{-2}^{0}\frac{\sin(nw_0t)}{nw_0}\right) + \int_{-2}^{0}\cos(nw_0t\right.$$

$u = t \quad du = dt$

$\int dv = \int \frac{\cos(nw_0t)}{nw_0}$

$V = \frac{\sin(nw_0t)}{nw_0} \quad uv - \int v\,du$

$$+\left(-t\frac{\sin(nw_0t)}{nw_0}\Big|_{0}^{2} - \int_{0}^{2}\frac{-\sin(nw_0t)}{nw_0}dt\right) + \int_{0}^{2}\cos(nw_0t)\Bigg]$$

0

$$\frac{1}{2}\left[\cancel{t\frac{\sin(nw_0t)}{nw_0}\Big|_{-2}^{0}} - \frac{1}{nw_0}\left(\frac{-\cos(nw_0t)}{nw_0}\right)\Big|_{-2}^{0} + \cancel{\frac{\sin(nw_0t)}{nw_0}\Big|_{-2}^{0}} - \cancel{t\frac{\sin(nw_0t)}{nw_0}\Big|_{0}^{2}}\right.$$

$0 \quad 0 \quad 0 \quad 0$

$$-\frac{\cos(nw_0t)}{n^2w_0^2}\Big|_{0}^{2} + \cancel{\frac{\sin(nw_0t)}{nw_0}\Big|_{0}^{2}}$$

0

$$w_0 = \frac{2\pi}{T} = \pi/2$$

$$\frac{1}{2}\left[\left[\frac{\cos(nw_0t)}{n^2w_0^2}\Big|_{-2}^{0} - \frac{\cos(nw_0t)}{n^2w_0^2}\Big|_{0}^{2}\right] = \right.$$

STAY COOL

$$\frac{1}{2m^2 w_0^2}\left[1 - \cos(-\pi n)\right] - \left[\cos(\pi n) - 1\right]$$

$$\frac{1}{2m^2 w_0^2}\left[2 - 2(-1)^n\right]$$

$$a_n \begin{cases} 0, & \text{par} \\ \dfrac{4}{2n^2 w_0^2}, & \text{impar} \end{cases} \rightarrow \frac{8}{4n^2\left(\frac{\pi^2}{2}\right)}$$

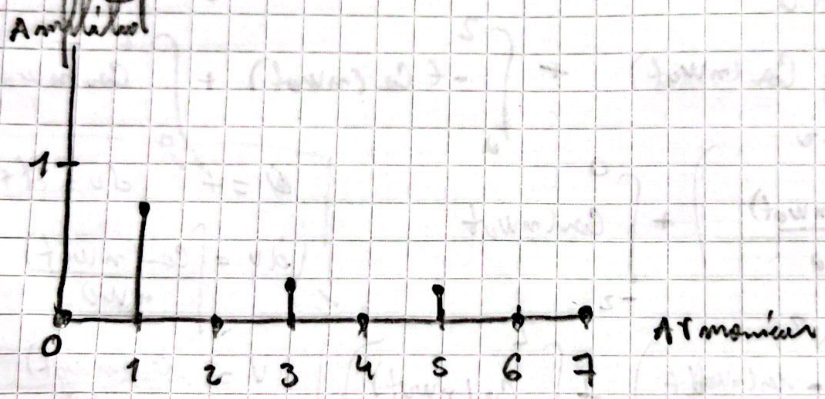
serie de fourier

$$x(t) = a_0 + \sum_{k=1}^{1} a_n \cos(n w_0 t)$$

$$x(t) = \sum_{k=1}^{\infty} \frac{4}{2n^2 w_0^2} \cos(n w_0 t)$$

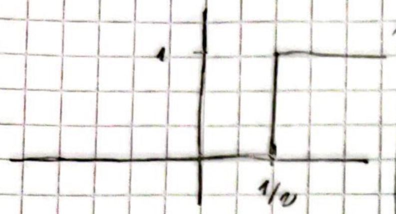
Espectro en línea

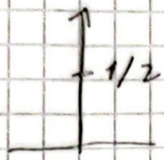
n = Armónico

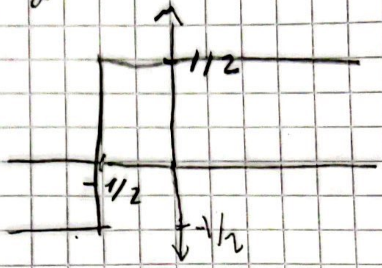


3 [illegible]

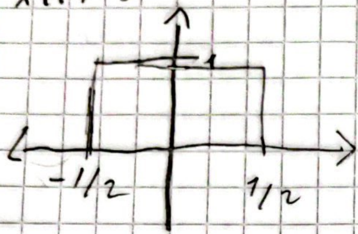
$x(t) = u(t - 1/2) \;|\; \frac{1}{2} \;|\; \frac{1}{2}\,\mathrm{sgn}(t + \frac{1}{2})$





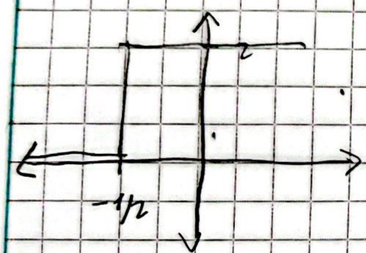


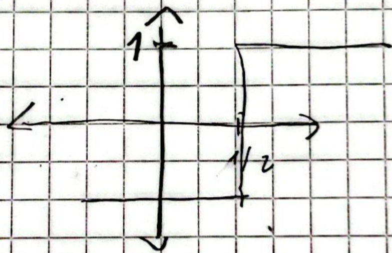
$x(t) =$

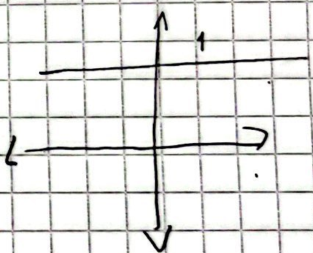


$h(t)$

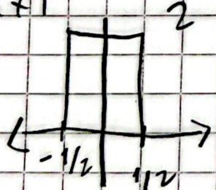
$2u(t + 1/2)$ $\mathrm{sgn}(t - 1/2)$ 1







$h(t)$



$$X(w) = 2 \cdot 1 \cdot \frac{1}{2} \cdot \frac{\sin(w/2)}{w/2} = \frac{\sin(w/2)}{w/2} = \frac{\sin(w/2)}{w/2}$$

$$H(w) = \frac{\sin(w/2)}{w/2} = 2\,\frac{\sin(w/t)}{w/2}$$

$$X(w) \cdot H(w) = 2\,\frac{\sin^2(w/2)}{w^2/2^2} \qquad y(t) = 2\,\mathcal{F}^{-1}\left\{\frac{\sin^2(w/2)}{w^2/2^2}\right\}$$

$$y(t) = 2 \begin{cases} 1 - \frac{|t|}{1}, & |t| < 1 \\ 0, & |t| > 1 \end{cases}$$