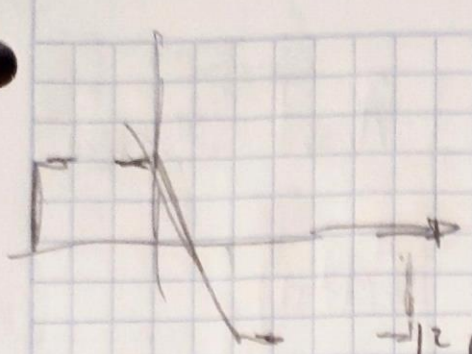
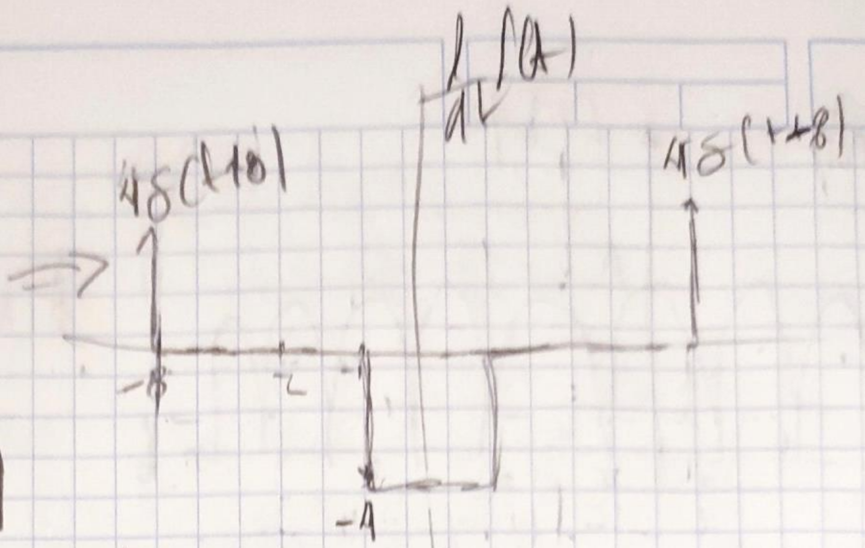
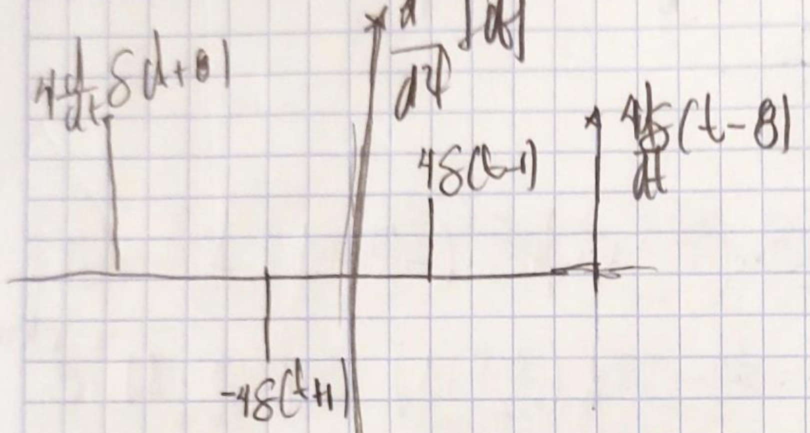






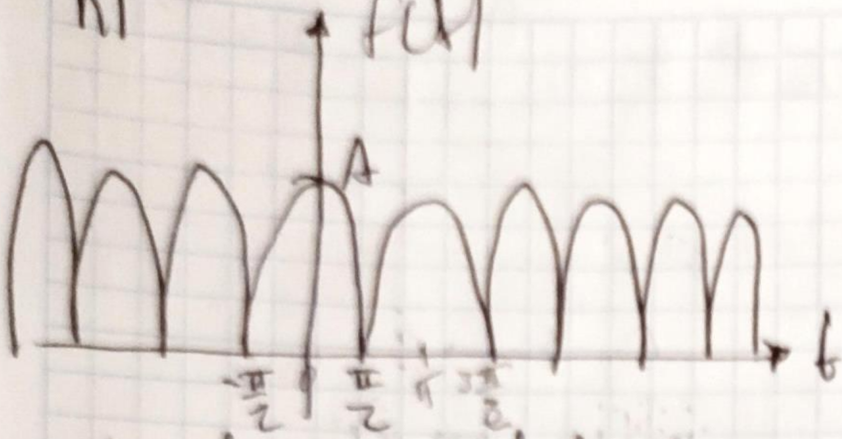
$$\mathcal{F}\left\{\frac{d^2}{dt^2}f(t)\right\} = \mathcal{F}\left\{4\frac{d}{dt}\delta(t+8)\right\} - \mathcal{F}\{4\delta(t+1)\} + \mathcal{F}\{4\delta(t-1)\} + \mathcal{F}\left\{4\frac{d}{dt}\delta(t-8)\right\}$$

$$(i\omega)^2 F(\omega) = i\omega 4\frac{d}{d\omega}e^{i8\omega} - 4e^{i\omega} + 4e^{-i\omega} + 4 i\omega\frac{d}{d\omega}e^{-i8\omega}$$

$$F(\omega) = \frac{-1}{\omega^2}\left\{-4e^{i\omega} + 4e^{-i\omega} + i\omega 4\frac{d}{d\omega}e^{i8\omega} + i\omega 4\frac{d}{d\omega}e^{-i8\omega}\right\}$$

$$\pm 8\pi\delta(t) \pm 2\pi[\delta(t+100) - \delta(t-100)] \quad \begin{cases} \theta, & -7<t<-2 \\ \theta & 2<t<7 \end{cases}$$

h)



$$f_1(t) = \begin{cases} A\cos t & -\frac{\pi}{2} < t < \frac{\pi}{2} \\ f(t+\pi) \end{cases}$$

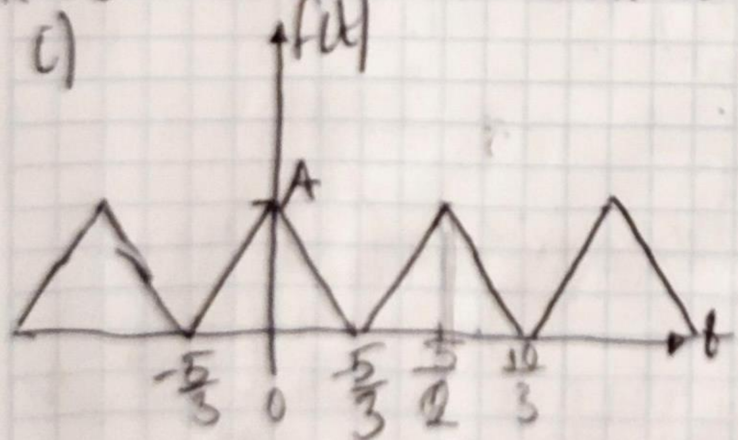
Usando resultado de (b)

$$A\cos t\, G_\pi(t) \longleftrightarrow \frac{A\pi}{2}\left[Sa\left(\frac{w\pi}{2}+1\right) + Sa\left(\frac{w\pi}{2}-1\right)\right]$$

$$A\cos t\, G_\pi(t+K\pi) \longleftrightarrow \frac{A\pi}{2}\left[Sa\left(\frac{w\pi}{2}+1\right) + Sa\left(\frac{w\pi}{2}-1\right)\right]e^{iK\pi}$$

$$\sum_{K=-\infty}^{\infty} A\cos t\, G_\pi(t+K\pi) \longleftrightarrow \sum_{K=-\infty}^{\infty} \frac{A\pi}{2}\left[Sa\left(\frac{w\pi}{2}+1\right) + Sa\left(\frac{w\pi}{2}-1\right)\right]e^{iK\pi}$$

c)



$$\Lambda\left(\frac{t}{d}\right) \longleftrightarrow \frac{Ad}{2} Sa^2 \frac{wd}{4}$$

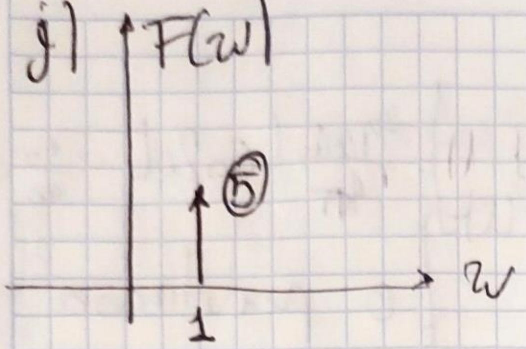
$$d = \frac{10}{3}$$

$$\Lambda\left(\frac{3t}{10}\right) \longleftrightarrow \frac{A10}{6} Sa^2 \frac{w10}{12}$$

$$\Lambda\left(\frac{3}{10}\left(t+\frac{K5}{2}\right)\right) \longleftrightarrow \frac{A10}{6} Sa^2 \frac{w10}{12} e^{i\frac{K5}{2}}$$

$$\sum_{n=-\infty}^{\infty} \Lambda\left(\frac{3}{10}\left(t+\frac{K5}{2}\right)\right) \longleftrightarrow \sum_{n=-\infty}^{\infty} \frac{A10}{6} Sa^2 \frac{w10}{12} e^{i\frac{K5}{2}}$$

j)



$$F(w) = 5\delta(t-1)$$

Calculando la inversa

$$\delta(t) \longleftrightarrow 1$$

$$\delta(t-1) \longleftrightarrow e^{-iw}$$

$$5\delta(t-1) \longleftrightarrow 5e^{-iw}$$

$$5e^{-iw} \longleftrightarrow 2\pi\, 5\delta(t+1)$$

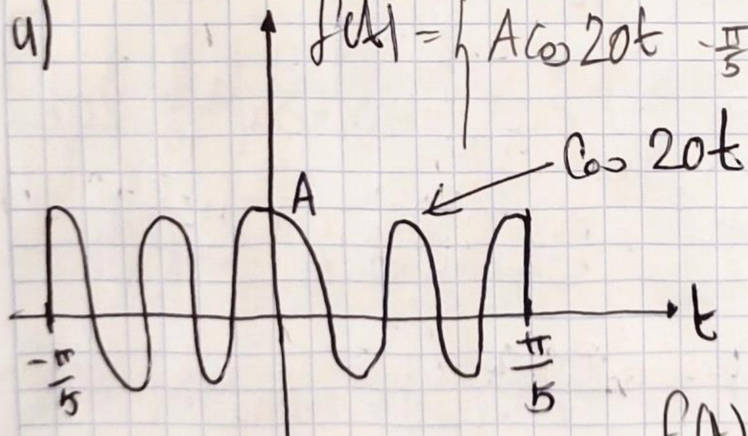
$$f(t) = \frac{5e^{-iw}}{2\pi} \quad \longleftrightarrow \text{Inversa } F(w) \quad \frac{5e^{-iw}}{2\pi} \longleftrightarrow 5\delta(t-1)$$

$$F(w) = 5e^{-iw}$$ Transformada Fourier de $F(w)$

Problema 12. Aplicando el teorema de modulación encontrar la transformada de cada una de las señales moduladas que se muestran

a)

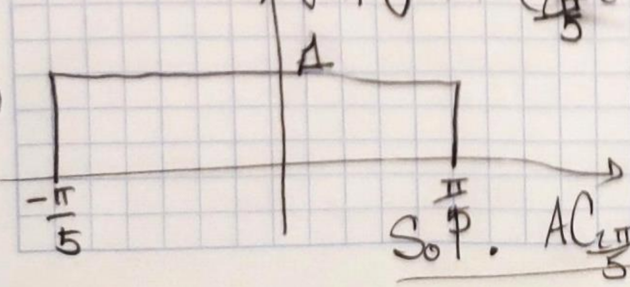
$$f(t) = \begin{cases} A\cos 20t & -\frac{\pi}{5} < t < \frac{\pi}{5} \end{cases}$$



$$f(t) \times g(t) = A\cos 20t\, C_{\frac{2\pi}{5}}(t)$$

$$\frac{d}{2} = \frac{\pi}{5}$$

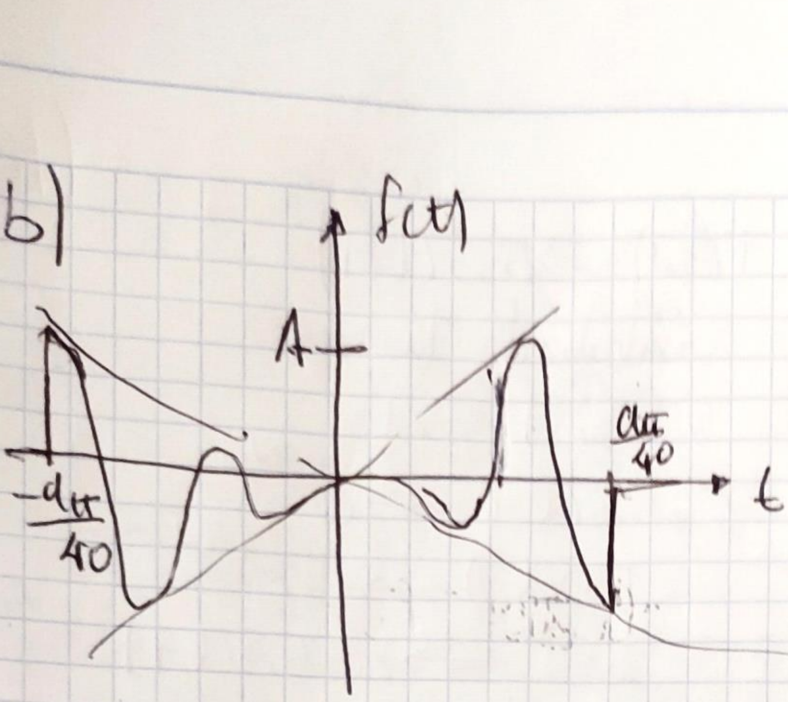
$$g(t) = C_{\frac{2\pi}{5}}(t) \qquad C_{\frac{2\pi}{5}}\, t \longleftrightarrow \frac{2\pi}{5} Sa\, \frac{w\pi}{5}$$



$$C_{\frac{2\pi}{5}}\, t\, \cos(20t) \longleftrightarrow \frac{\pi}{5}\left[Sa\left(\frac{w\pi}{5}+20\right) + Sa\left(\frac{w\pi}{5}-20\right)\right]$$

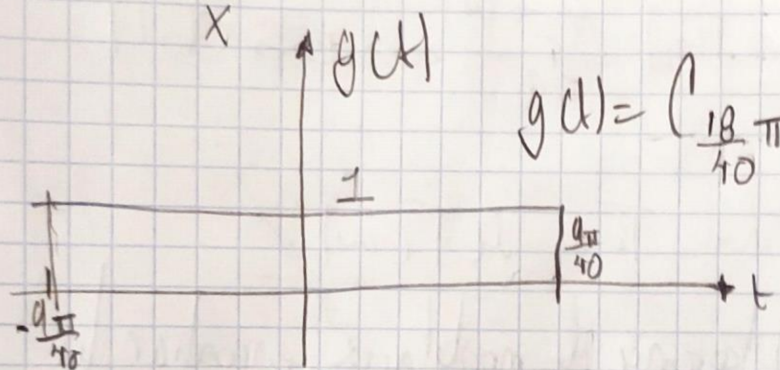
Sol. $A C_{\frac{2\pi}{5}}\, t \cos(20t) \longleftrightarrow \frac{A\pi}{5}\left[Sa\left(\frac{w\pi}{5}+20\right) + Sa\left(\frac{w\pi}{5}-20\right)\right]$

b)



$$f(t) = \begin{cases} -\frac{40A}{9\pi}\, t \cos 20t & -\frac{9\pi}{40} < t < \frac{9\pi}{40} \\ 0 & \text{para otro caso} \end{cases}$$

$$g(t) = C_{\frac{18}{40}\pi}\, t$$



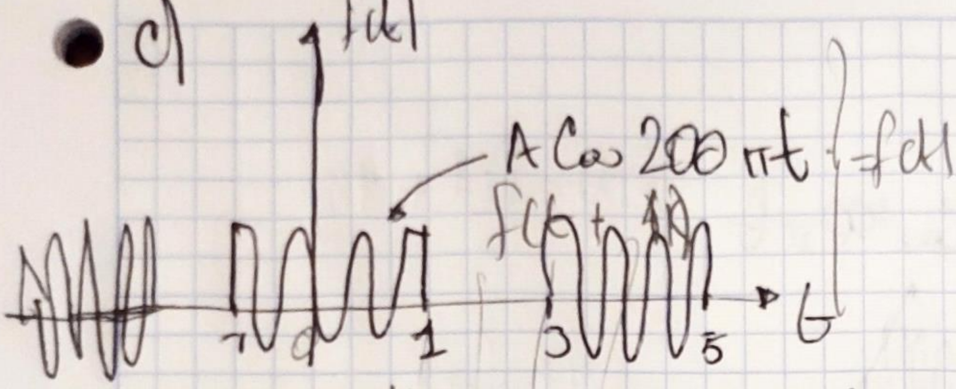
$$C_{\frac{18}{40}\pi}\, t \longleftrightarrow \frac{18\pi}{40}\, Sa\, \frac{w9\pi}{40}$$

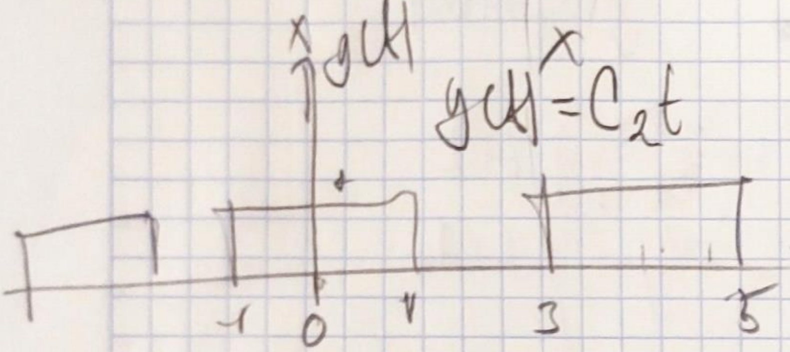
$$C_{\frac{18}{40}\pi}\, t \cos 20t \longleftrightarrow \frac{18\pi}{40}\left[Sa\left(\frac{w9\pi}{40} + 20\right) + Sa\left(\frac{w9\pi}{40} - 20\right)\right]$$

$$(-it)\, C_{\frac{18}{40}\pi}(t) \cos 20t \longleftrightarrow \frac{d}{dw}\left\{ \frac{18\pi}{40}\left[Sa\left(\frac{w9\pi}{40} + 20\right) + Sa\left(\frac{w9\pi}{40} - 20\right)\right]\right\}$$

$$-\frac{40A}{9\pi}\, t \cos 20t\, C_{\frac{18}{40}\pi}(t) \longleftrightarrow 2\pi A \frac{d}{dw}\left\{ Sa\left(\frac{w9\pi}{40} + 20\right) + Sa\left(\frac{w9\pi}{40} - 20\right)\right\}$$

c)





A Cos 200πt $G_2 t$

$$G_2 t \leftrightarrow 2\, Sa\, w$$

$$G_2 t \cos 200\pi t \leftrightarrow Sa(w+200\pi) + Sa(w-200\pi)$$

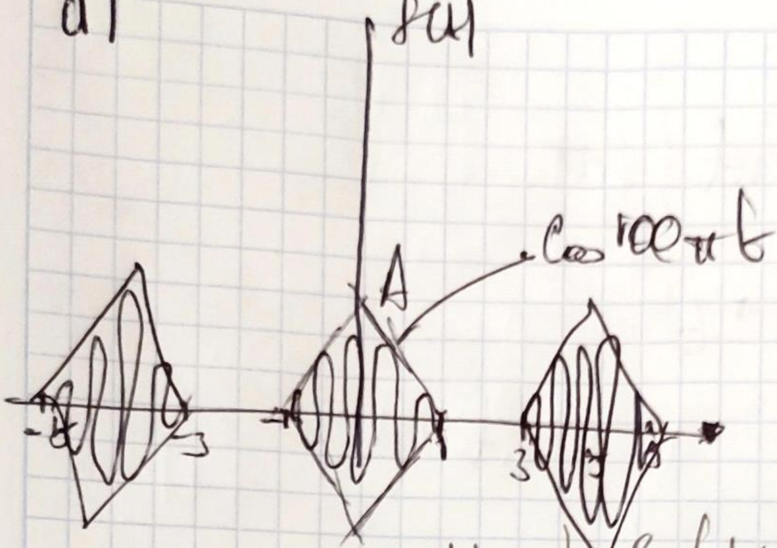
$$A G_2 t \cos 200\pi t \leftrightarrow A Sa(w+200\pi) + A Sa(w-200\pi)$$

$$t = t+4K$$

$$A G_2(t+4K) \cos(200\pi(t+4K)) \leftrightarrow A Sa(w+200\pi) + A Sa(w-200\pi) e^{j4Kw}$$

$$\sum_{K=-\infty}^{\infty} A G_2(t+4K) \cos(200\pi(t+4K)) \leftrightarrow \sum_{K=-\infty}^{\infty} A\{Sa(w+200\pi) + Sa(w-200\pi)\} e^{j4Kw}$$

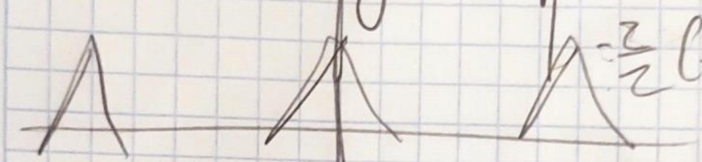
d)



$f(t) = f(t+4k)$

$g(t) \times f(t)$

$g(t) = \begin{cases} \frac{2}{2}\left(t+\frac{2}{2}\right) \\ -\frac{2}{2}(t+A) \end{cases} = \begin{cases} t+1 \\ t+1 \end{cases}$



$g(t) \longleftrightarrow Sa^2\left(\frac{w}{2}\right)$

$g(t)\cos 100\pi t \longleftrightarrow \frac{1}{2} Sa\left(\frac{w}{2}+100\pi\right) + Sa\left(\frac{w}{2}-100\pi\right)$

$g(t)\, A\cos 100\pi t \Big|_{t+4k} \longleftrightarrow \frac{A}{2}\left\{Sa\left(\frac{w}{2}+100\pi\right) + Sa\left(\frac{w}{2}-100\pi\right)\right\}\Big|_{\infty}$

$\sum_{n=-\infty}^{\infty} g(t+4k)\, A\cos 100\pi(t+4k) \longleftrightarrow \sum_{n=-\infty}^{\infty} \frac{A}{2}\left\{Sa\left(\frac{w}{2}+100\pi\right) + Sa\left(\frac{w}{2}-100\pi\right)\right\} e^{i4k}$

Sanchez Mendez Edmundo Jose

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