Scribe

① $z(t) = x(t) + y(t)$

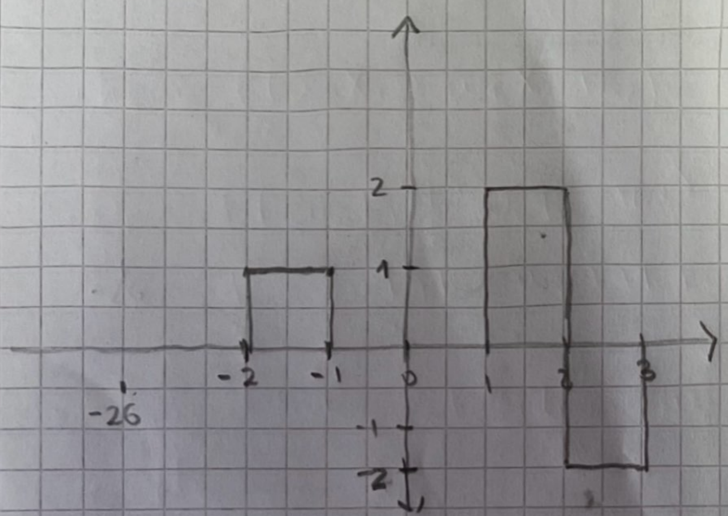
$z(t) = u(t+2) - u(t+1) + 2u(t-1) - 2u(t-2) - 2u(t-2) + 2u(t$

$z(t) = u(t+2) - u(t+1) + 2u(t-1) - 4u(t-2) + 2u(t-3)$

Graficar $w(t) = z(t) * r(2(t+k) - 6)$, con $k = 16$.

$z(t) * r(2t + 2k - 6)$, con $k = 16$.

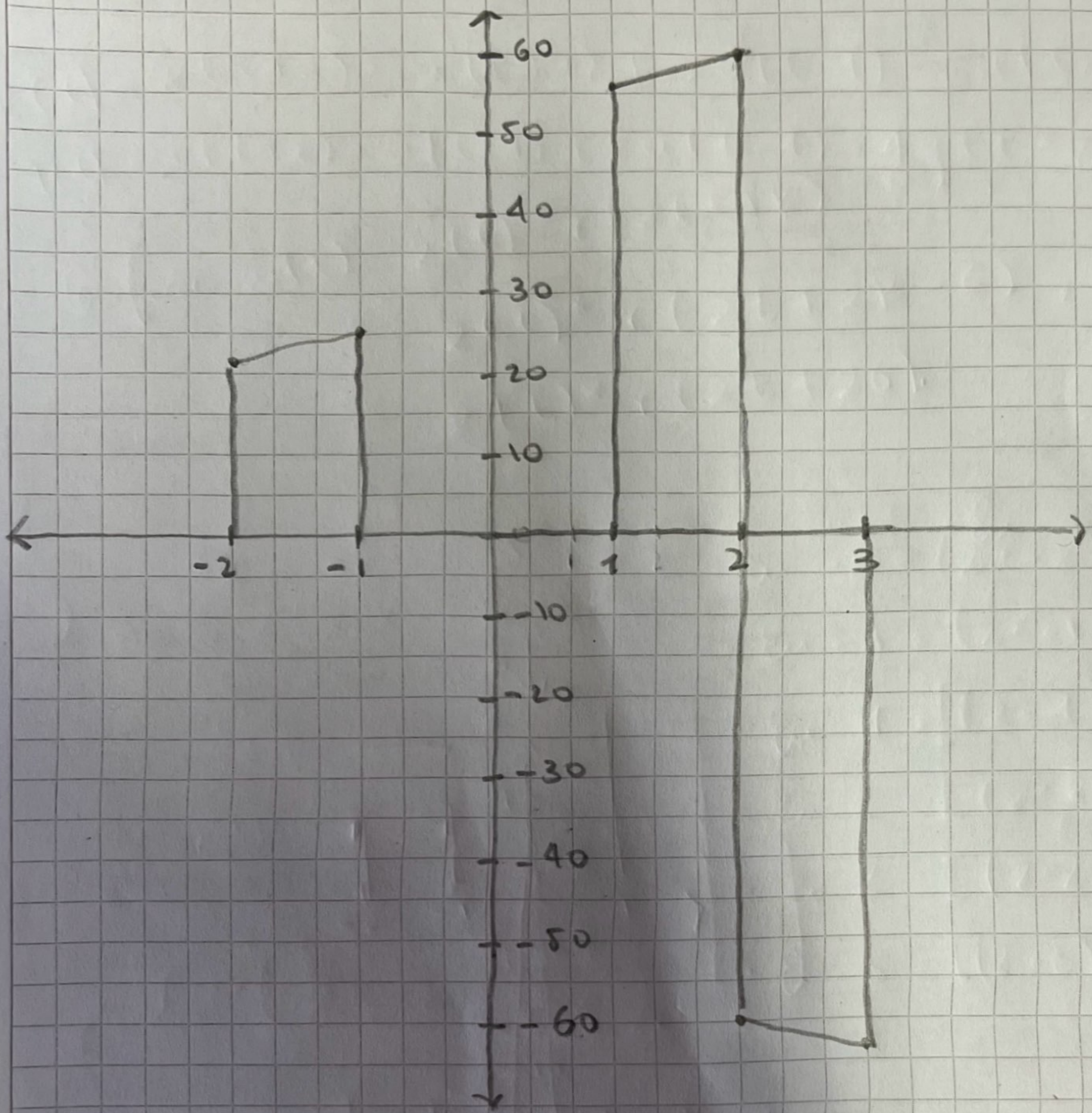
$z(t) * r(2t + 26)$.



- En $-2 = (2 \cdot -2) + 26 = 22$
- En $-1 = (2 \cdot -1) + 26 = 24$
- En $1 = [(2 \cdot 1) + 26] \cdot 2 = 56$
- En $2 = [(2 \cdot 2) + 26] \cdot 2 = 60$
- En $2 = [(2 \cdot 2) + 26] \cdot (-2) = -60$
- En $3 = [(2 \cdot 3) + 26] \cdot (-2) = -64$

$2(t+2) - 6)$

$2t - 6$.


60
50
40
30
20
10
-2
-1
1
2
3
-10
-20
-30
-40
-50
-60

3. Encontrar la Transformada de Fourier. Con $K = 16$.

$$x(t) = 4\,\mathrm{Sen}(80\pi t + \pi/4) + K\cos(40\pi t) + 5.$$

La transf. fourier son operaciones lineales, entonces:

$$x_1 = 4\,\mathrm{Sen}(80\pi t + \pi/4)$$
$$x_2 = K\cdot\cos(40\pi t)$$
$$x_3 = 5.$$

✓ Para $x_3(t) = 5\cdot 1.$

Se sabe que $\mathcal{F}\{\delta(t)\} = 1.$

$$\rightarrow \mathcal{F}\{1\} = 2\pi\,\delta(\omega)$$
$$\rightarrow \mathcal{F}\{5\cdot 1\} = 10\pi\,\delta(\omega).$$

Por prop. simetría-dualidad

$$\delta(t) \overset{\mathcal{F}}{\longleftrightarrow} 1$$
$$1 \longleftrightarrow 2\pi\,\delta(-\omega)$$
$$= 2\pi\,\delta(\omega)$$

↓ El impulso es par

✓ Para $x_1(t) =$

$$\mathcal{F}\{4\,\mathrm{Sen}(80\pi t + \pi/4)\}$$
$$= 4\,\mathcal{F}\{\mathrm{Sen}(80\pi t + \pi/4)\} = \frac{\cancel{4}^{\,2}}{\cancel{2}j}\,\mathcal{F}\left\{e^{j(80\pi t + \pi/4)} - e^{-j(80\pi t + \pi/4)}\right\}$$

$$= \frac{2}{j}\,\mathcal{F}\left\{e^{j80\pi t}e^{\frac{j\pi}{4}} - e^{-j80\pi t}e^{-j\frac{\pi}{4}}\right\}$$

$$= \frac{2}{j}\left(\mathcal{F}\{e^{j80\pi t}e^{j\frac{\pi}{4}}\cdot 1\} - \mathcal{F}\{e^{-j80\pi t}e^{-j\frac{\pi}{4}}\}\right).$$

$$= \frac{2}{j}\left(e^{j\frac{\pi}{4}}\underbrace{\mathcal{F}\{e^{j80\pi t}\cdot 1\}}_{\text{desplazamiento en frecuencia}} - e^{-j\frac{\pi}{4}}\underbrace{\mathcal{F}\{e^{-j80\pi t}\cdot 1\}}_{\text{desplazamiento en frecuencia}}\right).$$

$$= \frac{2}{j}\left(e^{j\frac{\pi}{4}}\cdot 2\pi\,\delta(\omega - 80\pi) - e^{-j\frac{\pi}{4}}\cdot 2\pi\,\delta(\omega + 80\pi)\right)$$

$$= -2j\left(e^{j\frac{\pi}{4}}\cdot 2\pi\,\delta(\omega - 80\pi) - e^{-j\frac{\pi}{4}}\cdot 2\pi\,\delta(\omega + 80\pi)\right).$$

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D M A

• Para $x_2(t) = K\cos(40\pi t)$ $\cos(\theta) = \frac{1}{2}(e^{j\theta} + e^{-j\theta})$.

$\rightarrow \frac{K}{2}\left(e^{40\pi j t} + e^{-40\pi j t}\right)$

$\rightarrow \frac{K}{2}\left(\underbrace{\mathcal{F}\{e^{40\pi j t}\} + \mathcal{F}\{e^{-40\pi j t}\}}_{\text{Desplazamiento en frecuencias}}\right)$.

$\rightarrow \frac{K}{2}\left(2\pi\,\delta(\omega - 40\pi) + 2\pi\,\delta(\omega + 40\pi)\right)$.

Entonces, la tranformada total es:

$$10\pi\,\delta(\omega) - 2j\left(e^{j\frac{\pi}{4}} \cdot 2\pi\,\delta(\omega - 80\pi) - e^{-j\frac{\pi}{4}} \cdot 2\pi\,\delta(\omega + 80\pi)\right)$$

$$+\ 8\left(2\pi\,\delta(\omega - 40\pi) + 2\pi\,\delta(\omega + 40\pi)\right)$$

Señal fisiológica definida entre $10 Hz$ y $55 Hz$ se toma con $fs = 100 Hz$.

a) Filtro pasa altas. $f_c = 10 Hz$.

$$\text{Salida} = \frac{\text{Entrada}}{10} \qquad A_{out} = \frac{A_{in}}{10}$$

$$20\log\left(\frac{A_{out}}{A_{in}}\right) = 20\log\left(\frac{\frac{A_{in}}{10}}{\frac{A_{in}}{1}}\right) = 20\log(1/10)$$

$$= -20\,dB$$

Ventana rectangular que atenúa $-21\,dB$

$$f_{c\,normal} = \frac{10 Hz}{100 Hz} = 0.1 Hz$$

$$\rightarrow 0.1 = \frac{0.9}{m} \rightarrow m = \frac{0.9}{0.1} = 9$$

rectangular la ventana es 1

$0 < n < N-1$

$[-4, 4]$

$b[0] = 2\pi(0.1) = 0.6283$

$$b[m] = \frac{\text{Sen}(2\pi f_c m)}{m}$$

$b[-4] = 0{,}1469$ $b[-2] = 0{,}4755$ $b[1] = 0{,}5877$ $b[3] = 0{,}3170$

$b[-3] = 0{,}3170$ $b[-1] = 0{,}5877$ $b[2] = 0{,}4755$ $b[4] = 0{,}1469$

m	-4	-3	-2	-1	0	1	2	3	4
b	0,1469	0,3170	0,4755	0,5877	0,6283	0,5877	0,4755	0,3170	0,1469
w	1	1	1	1	1	1	1	1	1
δ	0	0	0	0	1	0	0	0	0
h_{HPF}	-0,1469	-0,3170	-0,4755	-0,5877	0,3717	-0,5877	-0,4755	-0,3170	-0,1469

b) Pasa bajas $f_c = 50 Hz$.

$$f_{c\ normal} = \frac{50 Hz}{100 Hz} = 0.5$$

$$20 \log\left(\frac{A_{in}/100}{A_{in}}\right) = 20 \log\left(\frac{1}{100}\right) = \underbrace{-40 dB}_{\text{Puedo usar Hamming atenúa a } -53 dB}$$

$$\Delta F = \frac{3.1}{m}$$

$$0.54 - 0.46 \cos\left(\frac{2\pi n}{M-1}\right)$$

$$0 \le n \le M-1$$

$$m = \frac{3.3}{0.5} = 6.6 \approx 7 \quad [-3, 3]$$

$$b[0] = 2\pi f_c = \pi$$

$$b[m] = \frac{\operatorname{Sen}(2\pi f_c m)}{m} \quad \text{con } m \quad [-3, 3]$$

$b[-3] = 0$ $\quad$ $b[0] = \pi$ $\quad$ $b[3] = 0$

$b[-2] = 0$ $\quad$ $b[1] = 0$

$b[-1] = 0$ $\quad$ $b[2] = 0$

m	-3	-2	-1	0	1	2	3
b	0	0	0	π	0	0	0
w	0,08	0,31	0,77	1	0,77	0,31	0,08
h_{LPF}	0	0	0	π	0	0	0