(1)

RISPOSTA VELOCE

$g(t) = 8 \operatorname{sinc}(2t)$, $h(t) = 4 \operatorname{sinc}(2t)$

RISPOSTA ELABORATA

(non porta a punteggi maggiori, in caso di errore mi dà modo di capire meglio la vostra preparazione e capire perché avete sbagliato)

Per descrivere analiticamente il segnale $g(t)$, noto che $G(\mu)$ è una box nel dominio delle frequenze, $A \cdot \Pi(\mu/b)$, $A=4$, $b=2$. Per calcolare la trasformata, uso proprietà e formule notevoli:

Formule notevoli

$$\Pi(x_1) \xrightarrow{\mathcal{F} (o\, \mathcal{F}^{-1})} \operatorname{sinc}(x_2)$$

dove x_1 e x_2 sono le variabili del dominio di partenza e arrivo, rispettivamente

Proprietà

1) $A f(x_1) \xrightarrow{\mathcal{F} (o\, \mathcal{F}^{-1})} A \cdot F(x_2)$

2) $f(x_1/b) \xrightarrow{\mathcal{F} (o\, \mathcal{F}^{-1})} b F(b x_2)$

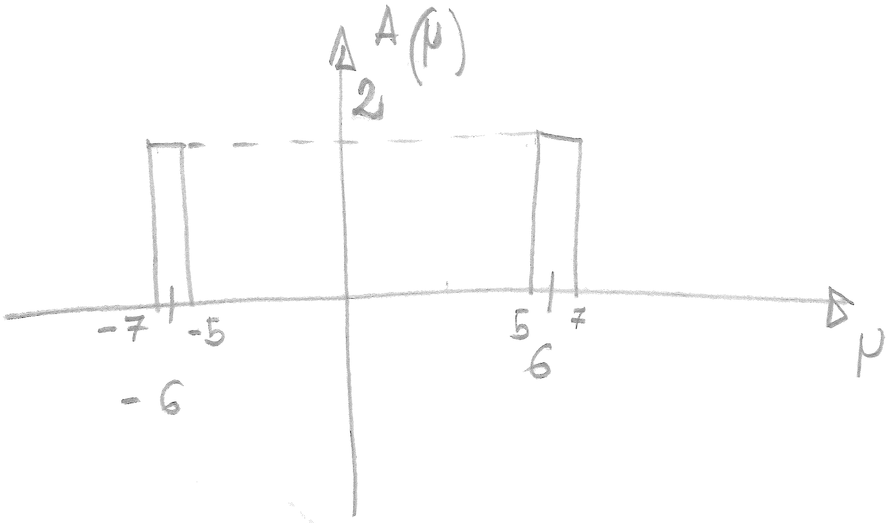
Per cui $4 \cdot \Pi(\mu/2) \xrightarrow{\mathcal{F}^{-1}} 4 \cdot 2 \operatorname{sinc}(2t) = 8 \operatorname{sinc}(2t) = g(t)$

e analogamente $h(t) = 2 \cdot 2 \operatorname{sinc}(2t) = 4 \operatorname{sinc}(2t)$

(2) $\quad$ I

i) $a(t) = g(t)\cdot\cos(2\pi 6 t)$

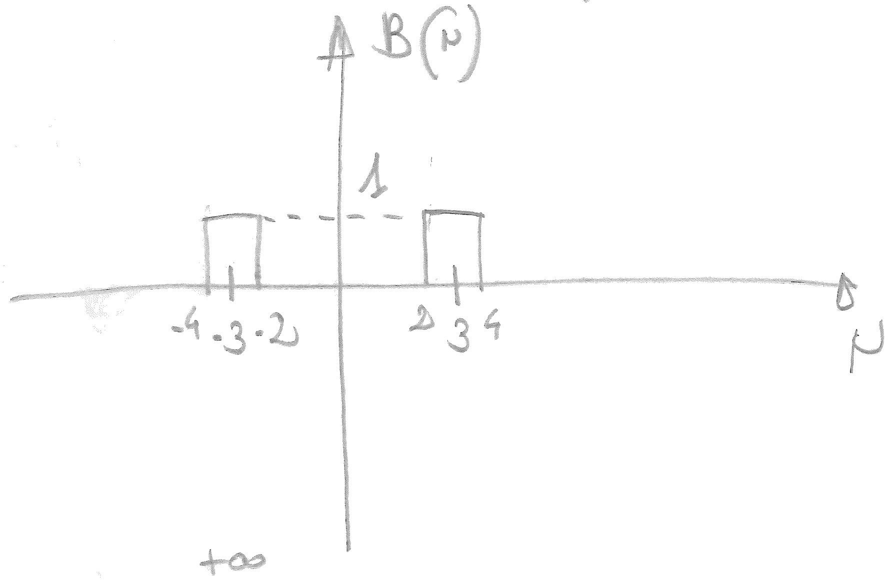
$$A(\mu) = G(\mu) * \frac{1}{2}\left[\delta(\mu+6) + \delta(\mu-6)\right]$$ forma analitica



forma grafica

ii) $b(t) = h(t)\cdot\cos(2\pi 3 t)$

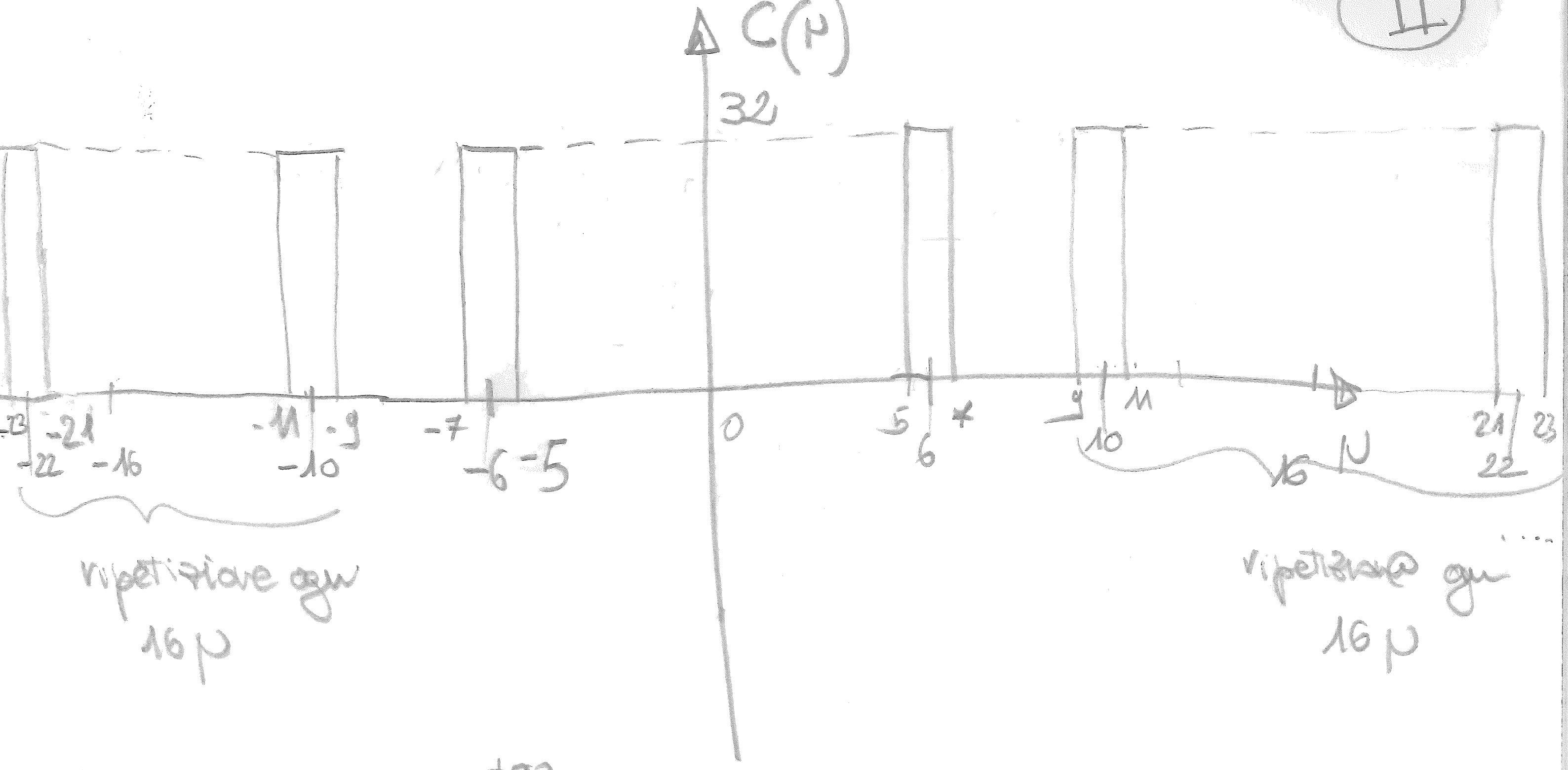
$$B(\mu) = H(\mu) * \frac{1}{2}\left[\delta(\mu+3) + \delta(\mu-3)\right]$$



iii) $$c(t) = a(t)\cdot\sum_{n=-\infty}^{+\infty}\delta\left(t - n(1/16)\right)$$

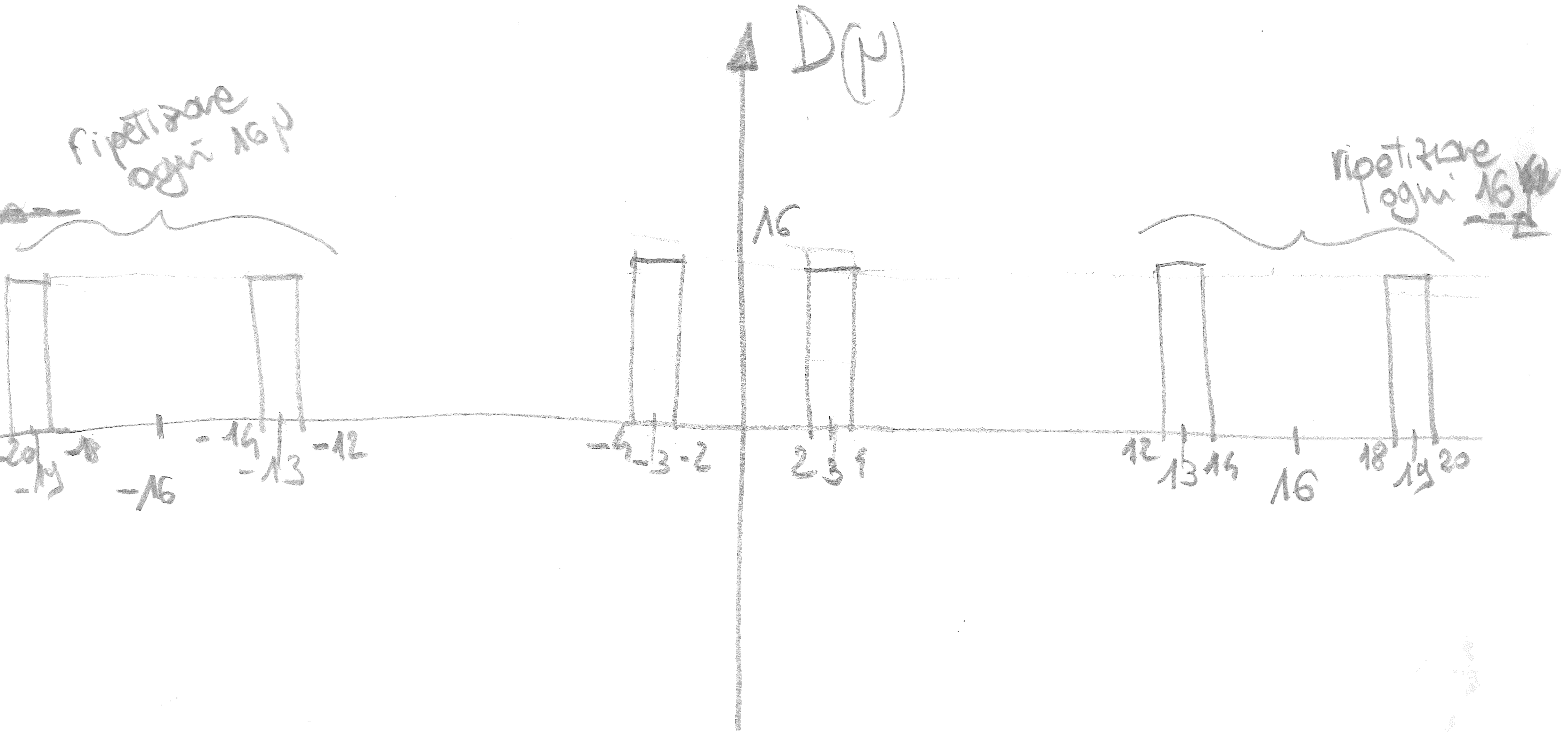
$$C(\mu) = A(\mu) * \frac{1}{1/16}\sum_{n=-\infty}^{+\infty}\delta\left(\mu - \frac{n}{\frac{1}{16}}\right) = A(\mu) * 16\sum_{n=-\infty}^{+\infty}\delta(\mu-16n)$$

II



iv) $$d(t) = b(t) \cdot \sum_{n=-\infty}^{+\infty} \delta\left(t - n\left(1/16\right)\right)$$

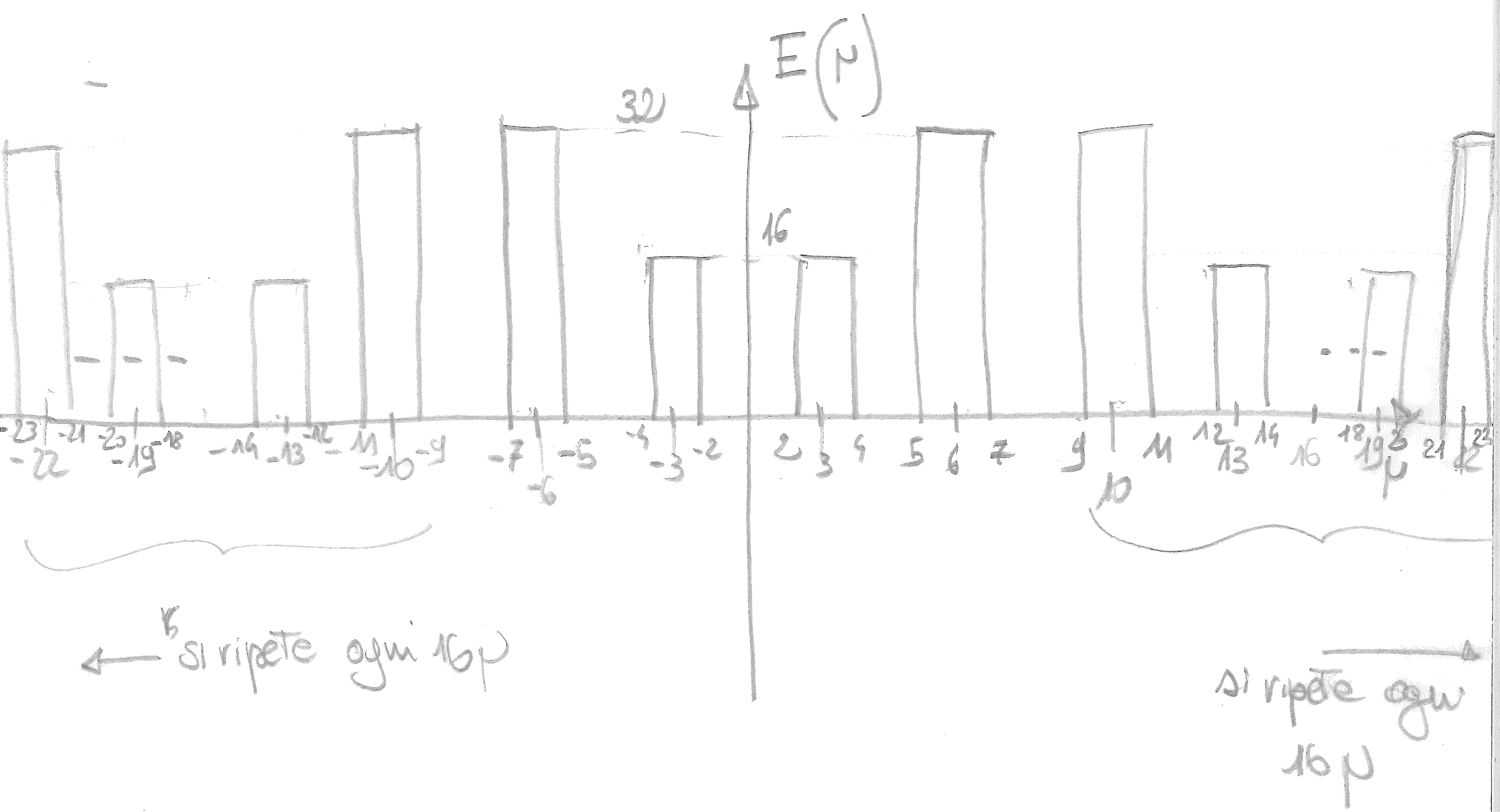
$$D(\nu) = B(\nu) * 16\sum_{n=-\infty}^{+\infty} \delta\left(\nu - 16n\right)$$



v) $$e(t) = \left[a(t) + b(t)\right] \cdot \sum_{n=-\infty}^{+\infty} \delta\left(t - n\cdot(1/16)\right)$$

III

$$E(\mu) = \left[A(\mu) + B(\mu)\right] * 16 \cdot \sum_{n=-\infty}^{+\infty} \delta(\mu - 16n)$$



APPENDICE ES.2

$$g(t) = 8\,\mathrm{sinc}(2t) \qquad h(t) = \cos(2\pi 6 t)$$

$$G(\mu) = 4 \cdot \Pi(\mu/2) \qquad H(\mu) = \frac{1}{2}\left[\delta(\mu+6) + \delta(\mu-6)\right]$$

$$\boxed{G(\mu) * H(\mu) = ?}$$

$$G(\mu) * \frac{1}{2}\left[\delta(\mu+6) + \delta(\mu-6)\right] = \int_{-\infty}^{+\infty} 4 \cdot \Pi(\tau/2) \cdot \frac{1}{2}\left[\delta(\mu+6-\tau) + \delta(\mu-6-\tau)\right]$$

$$= 2\int_{-\infty}^{+\infty} \Pi(\tau/2)\,\delta(\mu+6-\tau) + 2\int_{-\infty}^{+\infty} \Pi(\tau/2)\,\delta(\mu-6-\tau)$$

$+\mu+6$

$$= 2\,\Pi\left(\frac{\mu+6}{2}\right) + 2\,\Pi\left(\frac{\mu-6}{2}\right)$$

$$= 2\,\Pi\left(\frac{\mu}{2}+3\right) + 2\,\Pi\left(\frac{\mu}{2}-3\right)$$

box centrate in 3, ma in un sistema di riferimento 0.5x !!!

Ricordando che:

$$\Pi(x) = \begin{cases} 1 & -0.5 \le x \le 0.5 \\ 0 & \end{cases}$$

e sostituendo valori di μ in verifico la figura vista a lezione.

Π	x	μ
1	0	6
1	-0.5	5
0	-1	4
1	0.5	7