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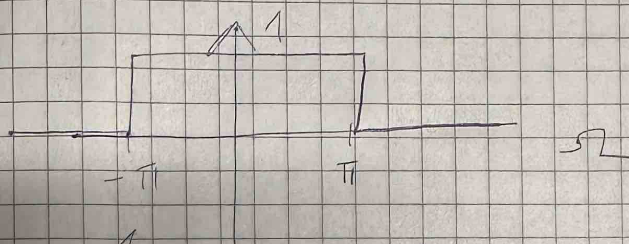
1. d) $x(t) = \text{sinc}(t)$ $\quad CTFT[x(t)] = \int_{-\infty}^{+\infty} x(t) \cdot e^{-j\Omega t} dt$

$$X_c(\Omega) = rect\left(\frac{\Omega}{2\pi}\right)$$

ovo piše u formulama

$$\frac{\Omega_{max}}{2\pi} = \pm\frac{1}{2}$$

$$\Omega_{max} = \pi$$



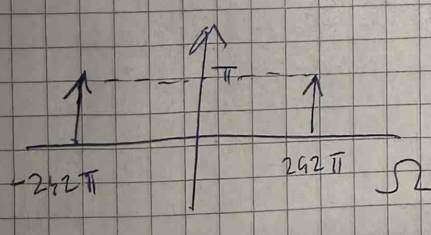
$\pi < \frac{\pi}{T_s} \Rightarrow T_s < 1$ → ne dolazi do preklapanja

$f_s = \frac{1}{T_s}$ $\quad \Omega_s = \frac{2\pi}{T_s}$ $\quad T_s < \frac{\pi}{\Omega_{max}}$

$f_s < 1$ → dolazi do preklapanja

a) $x(t) = \cos(242\pi t)$

$$X_c(\Omega) = \cancel{\pi(\delta(242\pi)} = \pi(\delta(\omega - 242\pi) + \delta(\omega + 242\pi))$$



$\Omega_{max} = 242\pi$

$$T_s < \frac{\pi}{\Omega_{max}}$$

$$T_s < \frac{1}{242}$$

$$\frac{1}{f_s} < \frac{1}{242}$$

$\boxed{242 < f_s}$ → ne dolazi do preklapanja

$\boxed{f_s < 242}$ → dolazi do preklapanja

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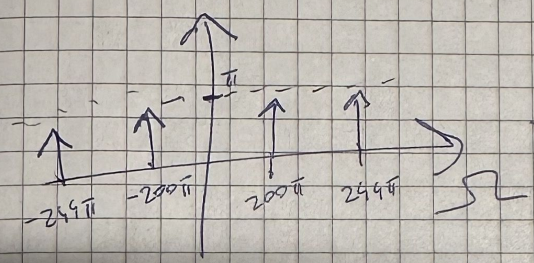
1.

b) $x(t) = \cos(244\pi t) + \cos(200\pi t)$

↓ iz formula

$$X_c(\Omega) = \pi\left(\delta(\Omega - 244\pi) + \delta(\Omega + 244\pi)\right)$$
$$+ \pi\left(\delta(\Omega - 200\pi) + \delta(\Omega + 200\pi)\right)$$



$\Omega_{max} = 244\pi$

↓

$$\frac{1}{f_s} < \frac{\pi}{\Omega_{max}}$$

$$\frac{1}{f_s} < \frac{\pi}{244\pi}$$

$$\frac{1}{f_s} < \frac{1}{244}$$

$\boxed{f_s > 244}$ → ne dolazi do preklapanja

$f_s < 244$ → dolazi do preklapanja

c) $x(t) = \sin(5400\pi t) + \sin(3200\pi t) + \sin(8400\pi t)$

↓ vidimo napamet da je $\Omega_{max} = 8400\pi$

$\frac{1}{f_s} < \frac{\pi}{\Omega_{max}}$ $\quad f_s > 8400$ → ne dolazi do preklapanja

$f_s < 8400$ → dolazi do preklapanja

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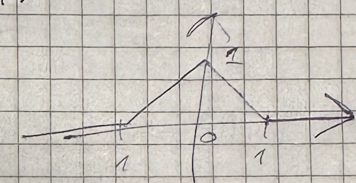
2. c) $T_s = 1$ $\quad x(t) = \mathrm{sinc}^2(t)$

$$x(t) = \mathrm{sinc}^2(t) = \begin{cases} \dfrac{\sin^2(\pi t)}{\pi^2 t^2}, & t \neq 0 \\ 1, & \cancel{t} = 0 \end{cases}$$

iz formula

$$X_c(\Omega) = \mathrm{tri}\left(\frac{\omega}{2\pi}\right)$$

$$\mathrm{tri}(x) = \begin{cases} 1 - |x|, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$$



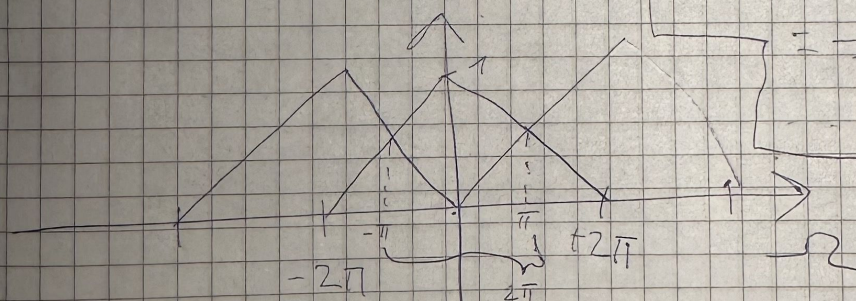
$\Omega_s > 2\Omega_{MAX}$

$\frac{2\pi}{T_s}$

$$\frac{\Omega}{2\pi} = \pm 1$$

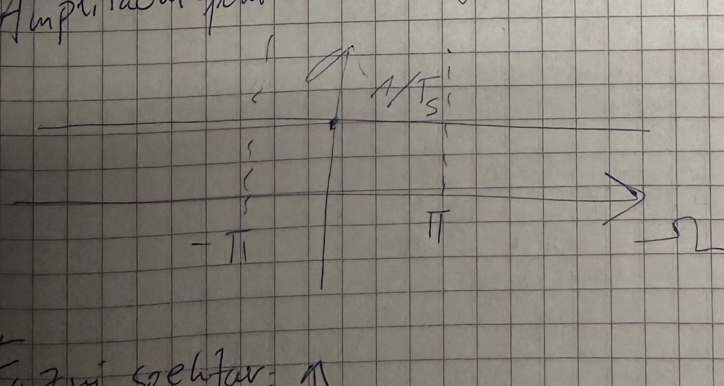
$$\Omega_s = \frac{2\pi}{T_s} = 2\pi$$

$$\boxed{X_d(\Omega) = \frac{1}{T_s} \sum_{k \in \mathbb{Z}} X_c(\Omega - k\Omega_s)}$$

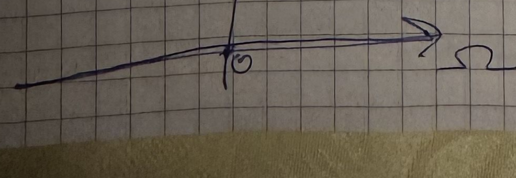


Ovo treba zapamtiti ovo ne piše u formulama

Amplitudni spektar:



Fazni spektar:



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3. a) $\Omega_{max} = 8\pi$

b) $T_s < \frac{\pi}{\Omega_{max}} = \frac{\pi}{8\pi} = \frac{1}{8}$

$$\boxed{0 < T_s < \frac{1}{8}}$$

$f_s = \frac{1}{T_s}$ $\quad 8 < f_s < \infty$

$$\boxed{f_{s_{min}} = 8 + w} \quad w > 0, w \in \mathbb{R}$$

c) $y(t) = x(2t+2) + \cos(10\pi t + \frac{\pi}{4})$

$$CTFT[y(t)] = \int_{-\infty}^{+\infty} x(2t+2) \cdot e^{-j\Omega t} \, dt =$$

$2t + 2 = \tau \Rightarrow t = \frac{\tau - 2}{2}$

$dt = \frac{1}{2} d\tau$

$$X(\Omega) = \int_{-\infty}^{+\infty} x(t) e^{-j\Omega t} \, dt$$

$$= \int_{-\infty}^{+\infty} x(\tau) e^{-j\frac{\tau-2}{2} \cdot \Omega} \frac{d\tau}{2} =$$

$$= \frac{1}{2} e^{+j\Omega} \underbrace{\int_{-\infty}^{+\infty} x(\tau) e^{-j\left(\frac{\Omega}{2}\right)\tau} \, d\tau}_{X\left(\frac{\Omega}{2}\right)}$$

nastavak c) zadatka

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$Z = |Z| e^{j \measuredangle Z}$