Domande:

$$\int_{-\infty}^{+\infty} \mathrm{sinc}\left(\frac{t}{T}\right)\mathrm{sinc}\left(\frac{0.1\,t}{T}\right)dt = \int_{-\infty}^{+\infty} T\cdot\frac{T}{0.1}\,\mathrm{rect}\,fT\;\mathrm{rect}\,\frac{fT}{0.1}\,df$$

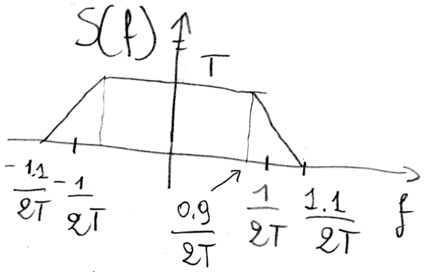
$$= \int_{-\infty}^{+\infty} T\cdot\frac{T}{0.1}\,\mathrm{rect}\,\frac{fT}{0.1}\,df = T$$

$\left[\text{area}\left\{\mathrm{sinc}\,\frac{t}{T}\,\mathrm{sinc}\,\frac{0.3t}{T}\right\} = T\right]$

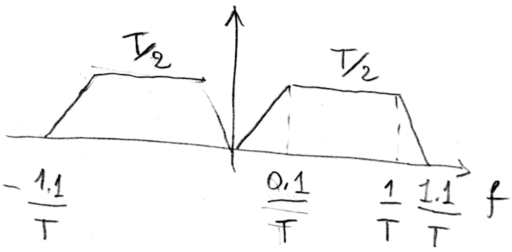
E1

$$x(t) = \mathrm{sinc}\,\frac{t}{T}\,\mathrm{sinc}\,\frac{0.1t}{T}\,\cos 2\pi\,\frac{1.1}{2T}\,t$$

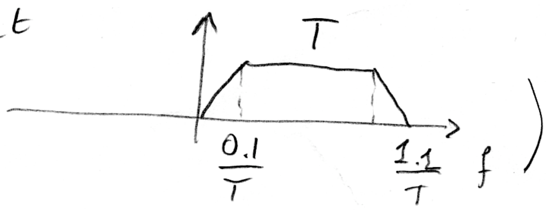
$$s(t) = \mathrm{sinc}\,\frac{t}{T}\,\mathrm{sinc}\,\frac{0.1t}{T}$$



$$X(f) = \frac{1}{2}S\left(f - \frac{1.1}{2T}\right) + \frac{1}{2}S\left(f + \frac{1.1}{2T}\right)$$



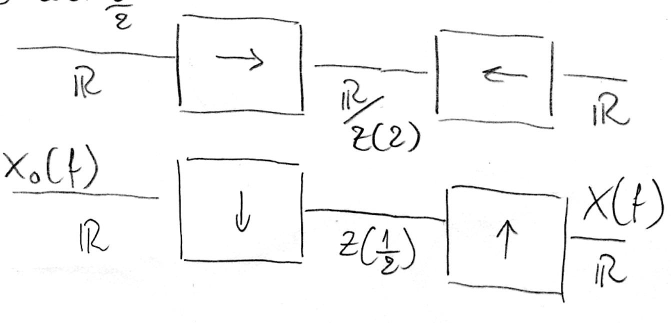
$\left(x(t) = \mathrm{sinc}\,\frac{t}{T}\,\mathrm{sinc}\,\frac{0.1}{T}t\; e^{+j2\pi\frac{1.1}{2T}t}\right.$



$\left.\right)$

E2

$$x_0(t) = t\,\mathrm{rect}\,\frac{t}{2}$$



$$X(f) = \frac{1}{2}\sum_{k=-\infty}^{+\infty} X_0\left(\frac{k}{2}\right)\delta_{\mathbb{R}}\left(f - \frac{k}{2}\right)$$

$$X_0(f) = \int_{-\infty}^{+\infty} t \,\mathrm{rect}\,\frac{t}{2}\, e^{-j2\pi f t}\, dt = \int_{-1}^{1} t\, e^{-j2\pi f t}\, dt$$

$$= \frac{1}{-j2\pi f}\, t\, e^{-j2\pi f t}\Big|_{-1}^{1} - \frac{1}{-j2\pi f}\int_{-1}^{+1} e^{-j2\pi f t}\, dt$$

$$= j\frac{1}{\pi f}\cos 2\pi f - j\frac{1}{2\pi^2 f^2}\sin 2\pi f$$

E3

NOTA: $\cos^2\alpha = \dfrac{1+\cos 2\alpha}{2}$ $\quad \sin^2\alpha = \dfrac{1-\cos 2\alpha}{2}$

$$x(kT) = \cos^2\frac{k\pi}{2} = \frac{1}{2} + \frac{1}{2}\cos k\pi = \frac{1}{2} + \frac{1}{2} e^{j kT 2\pi \frac{1}{2T}}$$

$$X(f) = \frac{1}{2}\,\delta_{\mathbb{R}/\mathbb{Z}(\frac{1}{T})}(f) + \frac{1}{2}\,\delta_{\mathbb{R}/\mathbb{Z}(\frac{1}{T})}\left(f - \frac{1}{2T}\right)$$

E4

$$H_z(z) = T\,\frac{2 - 1.3z^{-1}}{1 - 1.3z^{-1} + 0.4z^{-2}} = \frac{T}{1-0.8z^{-1}} + \frac{T}{1-0.5z^{-1}}$$

$$p_{12} = \frac{1.3 \pm \sqrt{(1.3)^2 - 1.6}}{2} = \begin{cases} 0.8 \\ 0.5 \end{cases}$$

$$h(kT) = (0.8)^k 1_0(kT) + (0.5)^k 1_0(kT)$$