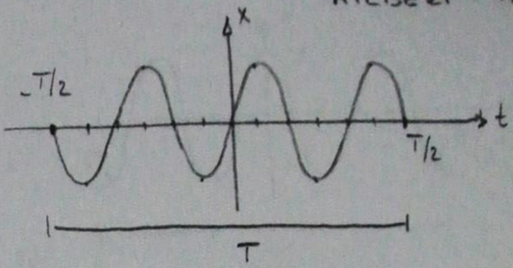
$x = \sin \omega_c t \quad ; \quad \omega_c = n \cdot \frac{2\pi}{T} = n\omega$

$\omega = 2\pi \frac{1}{T}$



spekter

$$F(x) = \frac{1}{T} \int_{-T/2}^{T/2} \frac{e^{in\omega t} - e^{-in\omega t}}{2i} e^{-ik\omega t} \, dt =$$

$$= \frac{1}{2iT} \int_{-T/2}^{T/2} e^{i(n-k)\omega t} \, dt - \frac{1}{2iT} \int_{-T/2}^{T/2} e^{-i(n+k)\omega t} \, dt =$$

$$= \frac{1}{2iT} \frac{1}{i(n-k)\omega} e^{i(n-k)\frac{2\pi}{T} t} \Big|_{-T/2}^{T/2} - \frac{1}{2iT} \frac{1}{-i(n+k)\omega} e^{-i(n+k)\frac{2\pi}{T} t} \Big|_{-T/2}^{T/2} =$$

$$= \frac{1}{2iT} \frac{T}{i(n-k)2\pi} \underbrace{\left[e^{i(n-k)\pi} - e^{-i(n-k)\pi} \right]}_{2i \sin (n-k)\pi} - \frac{1}{2iT} \frac{T}{-i(n-k)2\pi} \underbrace{\left[e^{-i(n+k)\pi} - e^{+i(n+k)\pi} \right]}_{-2i \sin (n+k)\pi} =$$

$$= -\frac{i}{2} \frac{\sin (n-k)\pi}{(n-k)\pi} + \frac{i}{2} \frac{\sin (n+k)\pi}{(n+k)\pi}$$

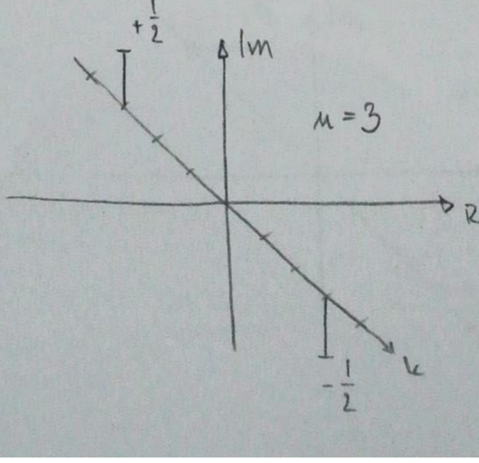
števec: $\sin (n-k)\pi = 0$ za vsak n in vsak k

imenovalec: $(n-k)\pi = \begin{cases} 0 & \text{za } n = k \\ \neq 0 & \text{za vsak } n \neq k \end{cases}$

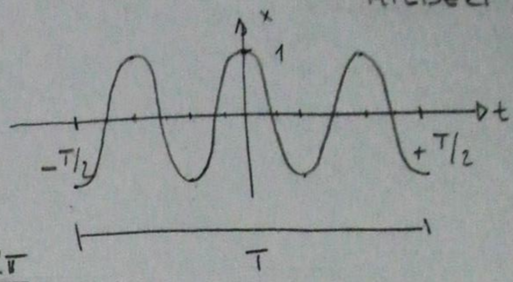
torej imamo ulomek:

$- \frac{\sin 0}{0}$ za $n = k$

$- \frac{0}{n\pi}$ za $n \neq k$



$x = \cos \omega_c t \quad ; \quad \omega_c = n \cdot \frac{2\pi}{T} = n\omega$



spekter:

$$F(x) = \frac{1}{T}\int_{-T/2}^{T/2} x\, e^{-ik\omega t}\, dt \quad ; \quad \omega = \frac{2\pi}{T}$$

$$F(x) = \frac{1}{T}\int_{-T/2}^{T/2} \frac{e^{in\omega t} + e^{-in\omega t}}{2}\, e^{-ik\omega t}\, dt =$$

$$= \frac{1}{2T}\int_{-T/2}^{T/2} e^{i(n-k)\omega t}\, dt + \frac{1}{2T}\int_{-T/2}^{T/2} e^{-i(n+k)\omega t}\, dt =$$

$$= \frac{1}{2T}\,\frac{1}{i(n-k)\omega}\, e^{i(n-k)2\pi\frac{t}{T}}\Bigg|_{-T/2}^{T/2} + \frac{1}{2T}\,\frac{1}{-i(n+k)\omega}\, e^{-i(n+k)2\pi\frac{t}{T}}\Bigg|_{-T/2}^{T/2} =$$

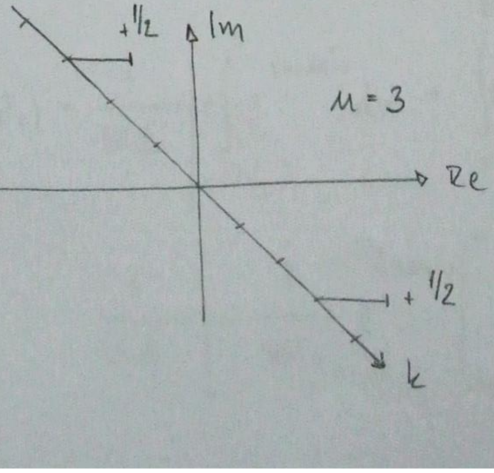
$$= \frac{1}{2i(n-k)\omega T}\cdot\Big[\underbrace{e^{i(n-k)\pi} - e^{-i(n-k)\pi}}_{2i\sin(n-k)\pi}\Big] - \frac{1}{2i(n+k)\omega T}\Big[\underbrace{e^{-i(n+k)\pi} - e^{+i(n+k)\pi}}_{-2i\sin(n+k)\pi}\Big] =$$

$$= \frac{1}{2}\,\frac{\sin(n-k)\pi}{(n-k)\pi} + \frac{1}{2}\,\frac{\sin(n+k)\pi}{(n+k)\pi}$$

števec: $\sin(n-k)\pi = 0$ za vsak n in vsak k

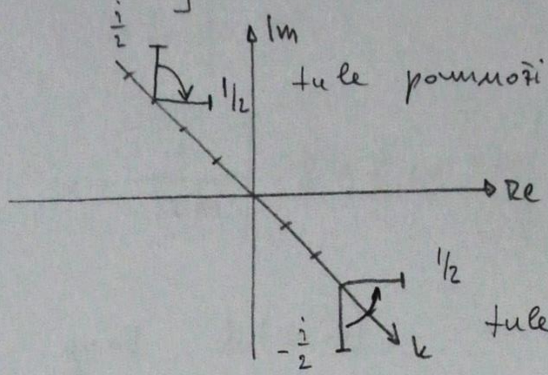
imenovalec: $(n-k)\pi = \begin{cases} 0 & \text{za } n = k \\ \neq 0 & \text{za } n \neq k \end{cases}$

! torej imamo ulomek $\frac{\sin x}{x}$ za $n = k$ in $\frac{0}{x}$ za $n \neq k$



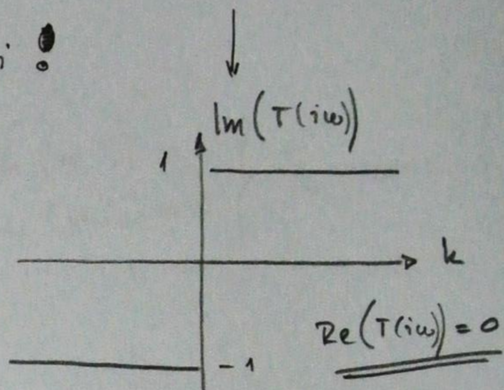
tako izgleda $\cos 3\omega t$ spekter

$$\xrightarrow[x(t)]{\sin \omega t} \boxed{T(i\omega)} \xrightarrow[y(t)]{\cos \omega t} \qquad T(i\omega) = \frac{F(y(t))}{F(x(t))}$$



tule pomnoži z $-i$!

tule pomnoži z i !



v splošnem : za $k > 0$: množi z i
za $k < 0$: množi z $-i$

tole velja za zvezne funkcije

za diskretno $T_D(i\omega)$ velja: - omejena na interval $\left\{ -\frac{\omega_v}{2} \text{ do } \frac{\omega_v}{2} \right\}$
- zunaj intervala se ponovlja
- amplituda je utežena:

$$T_D(i\omega) = \frac{1}{T_v} T_A(i\omega)$$

- $t = kT_v$

zato določimo:

$$h(t) = F^{-1}(T_A(i\omega)) \Rightarrow h(mT_v) = F^{-1}(T_D(i\omega))$$

$$h(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} T_A(i\omega) e^{i\omega t} d\omega \Rightarrow h(mT_v) = \frac{1}{2\pi} \frac{1}{f_v} \int_{-\omega_v/2}^{\omega_v/2} T_A(i\omega) e^{i\omega m T_v} d\omega \quad ; \omega_v = \frac{2\pi}{T_v}$$

$$h(mT_v) = \frac{1}{2\pi f_v} \left[-\int_{-\omega_v/2}^{0} i e^{i\omega m T_v} d\omega + \int_{0}^{\omega_v/2} i e^{i\omega m T_v} d\omega \right] =$$

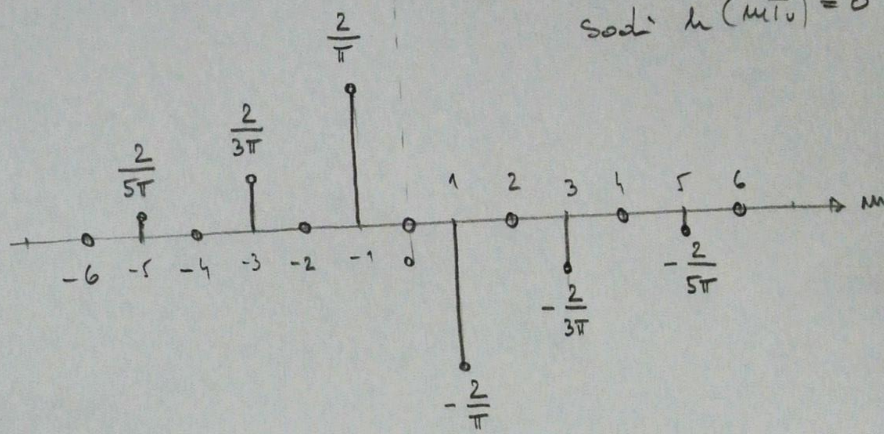
$$= \frac{1}{2\pi f_v} \left[-\frac{i}{imT_v} e^{i\omega m T_v} \Big|_{-\omega_v/2}^{0} + \frac{i}{imT_v} e^{i\omega m T_v} \Big|_{0}^{\omega_v/2} \right] =$$

$$= \frac{1}{2\pi f_v}\left[-\frac{i}{imT_v}\left(e^{0} - e^{i\pi m}\right) + \frac{i}{imT_v}\left(e^{i\pi m} - e^{0}\right)\right] =$$

$$= + \frac{1}{2\pi m}\left[-2 + 2\cos\pi m\right] = \frac{\cos\pi m - 1}{\pi m} = \frac{(-1)^{m} - 1}{\pi m}$$

graf $h(mT_v)$

$$\left.\begin{array}{l} \text{lihi } h(mT_v) \neq 0 \\ \text{sodi } h(mT_v) = 0 \end{array}\right\} \text{1/2 operacij!}$$



tole uporabi v konvoluciji