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"HDT #5"

Sesse 1:

1) $\begin{cases} 1 & \text{para } 0 \le t \le 1 \\ -1 & \text{para } -1 \le t \le 0 \\ 0 & \text{otro caso} \end{cases}$

Se puede reescribir como

$-H(t+1) + H(t) + H(t) - H(t-1)$

$\rightarrow 2H(t) - H(t+1) - H(t-1)$

$\rightarrow -\int_{-1}^{0} e^{-j\omega t}\,dt + \int_{0}^{1} e^{-j\omega t}\,dt \rightarrow + \frac{e^{-j\omega t}}{j\omega}\Big|_{-1}^{0} - \frac{e^{-j\omega t}}{j\omega}\Big|_{0}^{1}$

$\rightarrow \frac{1}{j\omega} - \frac{e^{j\omega}}{j\omega} - \frac{e^{-j\omega}}{j\omega} + \frac{1}{j\omega} \rightarrow \frac{2}{j\omega} - \left(\frac{e^{j\omega} + e^{-j\omega}}{j\omega}\right)$

$\rightarrow \frac{2}{j\omega} - \frac{2\cos(\omega)}{j\omega} \rightarrow \underline{\underline{\frac{2 - 2\cos(\omega)}{j\omega}}}$

2) $x(t) = e^{3jt}[H(t+1) - H(t-1)]$

$\omega_0 = 3$

$\hat{x}(t) = \underline{\underline{\frac{2}{\omega - 3}\operatorname{sen}(a[\omega - 3])}}$

3) $x(t) = 4H(t-2)e^{-3t}$

$\rightarrow 4\int_{2}^{\infty} e^{-3t} e^{-j\omega t}\,dt \rightarrow 4\int_{2}^{\infty} e^{-t(3+j\omega)}\,dt \rightarrow 4\left[\frac{e^{-t(3+j\omega)}}{3+j\omega}\right]_{2}^{\infty}$

$\rightarrow 4\frac{e^{-2(3+j\omega)}}{3+j\omega} \rightarrow \underline{\underline{\frac{4e^{-6-2j\omega}}{3+j\omega}}}$

Sesse 2:

1) $\hat{f}(\omega)=\dfrac{1}{3+i\omega}$ $\qquad f(t)=H(t)e^{-3t}$ //

2) $\dfrac{10\,\operatorname{sen}(3\omega)}{\pi+\omega}$ $\qquad$ ~~$\left(f(t)=\dfrac{5}{\pi}\int_{-\infty}^{\infty}\dfrac{\operatorname{sen}(3\omega)\,e^{i\omega t}}{\pi+\omega}\,d\omega\right)$~~

~~$\to\dfrac{5}{\pi}\int_{-\infty}^{\infty}\dfrac{e^{3i\omega}-e^{-3i\omega}}{2i}\cdot\dfrac{e^{i\omega t}}{\pi+\omega}\,d\omega$ $\qquad u=\pi+\omega \qquad \omega=u-\pi \qquad du=d\omega$~~

~~$\to\dfrac{5}{\pi}\int_{-\infty}^{\infty}e^{i\omega(3+t)}$~~

~~$\to\dfrac{5}{\pi}\int_{-\infty}^{\infty}\left(\dfrac{e^{i(u-\pi)(3+t)}}{2iu}-\dfrac{e^{-i(u-\pi)(3-t)}}{2iu}\right)du$~~

~~$\to\dfrac{5}{2i\pi}\int_{-\infty}^{\infty}\left[\dfrac{e^{-(3i\pi+ti\pi)}\,e^{3iu+tiu}-e^{3i\pi-ti\pi}\,e^{tiu-3iu}}{u}\right]du$~~

~~$i(u-\pi)(3+t)=(iu-i\pi)(3+t)=3iu+tiu-3i\pi-ti\pi$~~

~~$-i(u-\pi)(3-t)=(i\pi-iu)(3-t)=3i\pi-ti\pi-3iu+tiu$~~

~~$\to\dfrac{5}{2i\pi}\left[e^{-(3i\pi+ti\pi)}\int_{-\infty}^{\infty}\dfrac{e^{3iu+tiu}}{u}\,du-e^{3i\pi-ti\pi}\int_{-\infty}^{\infty}\dfrac{e^{tiu-3iu}}{u}\,du\right]$~~

~~$\to\dfrac{5e^{-ti\pi}}{2i\pi}\left[e^{-3i\pi}\int_{-\infty}^{\infty}\dfrac{e^{iu(3+t)}}{u}\,du-e^{3i\pi}\int_{-\infty}^{\infty}\dfrac{e^{iu(t-3)}}{u}\,du\right]$~~

$\dfrac{10\,\operatorname{sen}(3\omega)}{\pi+\omega}$ $\qquad u=\pi+\omega \qquad \omega=u-\pi$

$\to\dfrac{10\,\operatorname{sen}(3u-3\pi)}{u}\to\dfrac{10}{u}\left[\operatorname{sen}(3u)\cos(3\pi)-\cos(3u)\operatorname{sen}(3\pi)\right]$ $\quad (\cos(3\pi)=-1,\ \operatorname{sen}(3\pi)=0)$

$\to-\dfrac{10\,\operatorname{sen}(3u)}{u}$ $\qquad$ ~~$\left(f(t)=\ldots\ 5\right)$~~

$f(t)=-5\left[H(t+3)-H(t-3)\right]$ //