Serie # 2

$\hat{f}(\omega) = \dfrac{1}{3+i\omega}$ $\qquad \tilde{\mathcal{F}}\{u(t)e^{-at}\} = \dfrac{1}{a+i\omega}$

$\mathcal{F}^{-1}\{\hat{f}(\omega)\} = \underline{u(t)e^{-3t}}$

$\hat{f}(\omega) = \dfrac{10\sin(3\omega)}{\omega+\pi} = \dfrac{2(5)\,\text{sen}(3\omega)}{\omega+\pi}$

$\dfrac{2(5)}{\omega+\pi}\,\text{sen}\,(3(\omega+\pi-\pi)) = \dfrac{2(5)}{\omega+\pi}\,\text{sen}(3(\omega+\pi)-3\pi)$.

$\hat{f} = \dfrac{10}{\omega}\,\text{sen}\,(3\omega)$

$\hat{f}(\omega-\omega_0) \qquad \omega = -\pi$

$\hat{f}(\omega-(-\pi)) = \dfrac{10}{\omega+\pi}\,\text{sen}(3($

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

$$\mathcal{F}\{f(t)\} = \int_{-\infty}^{\infty} f(t)\, e^{-i\omega t}\, dt =$$

$H(t-2)$

$$= 4\int e^{-3t}\, e^{-i\omega t}\, dt$$

$$= 4\int e^{-3t-i\omega t}\, dt = 4\int e^{-t(3+i\omega)}\, dt.$$

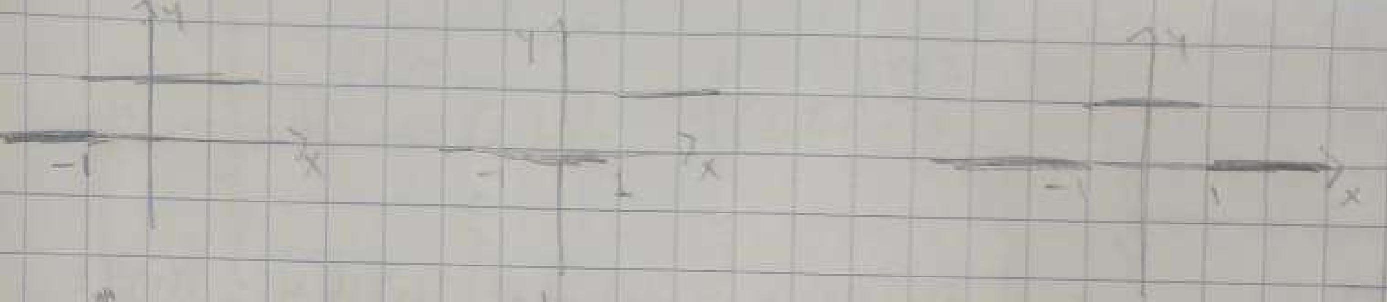
$$\left[\frac{4}{3+i\omega}\, e^{-t(3+i\omega)}\right]_{0}.$$

$$= \frac{4}{3+i\omega}\left[e^{-t(3+i\omega)} - \cancel{e^{-t(3+i\omega)}}\right] = \frac{4}{3+i\omega}\, e^{-2(3+i\omega)}$$

2. $f(t) = e^{3it}\left[H(t+1) - H(t-1)\right]$

$$\mathcal{F}\{f(t)\} = \int_{-\infty}^{\infty} f(t)\, e^{-i\omega t}\, dt.$$

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



$$= \int_{-1}^{1} f(t)\, e^{-i\omega t}\, dt = \int_{-1}^{1} e^{3it} \cdot e^{-i\omega t}\, dt.$$

$$= \int_{-1}^{1} e^{3it - i\omega t}\, dt = \int_{-1}^{1} e^{it(3-\omega)}\, dt.$$

$$= \left[\frac{1}{i(3-\omega)}\, e^{it(3-\omega)}\right]_{-1}^{1}$$

$$\frac{1}{i(3-\omega)}\left[e^{it(3-\omega)} - e^{it(3-\omega)}\right] \cdot \frac{2}{2}$$

$$\frac{2\sin(3-\omega)}{3-\omega}$$

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$$1.\ \begin{cases} 1 & \text{Para } 0 \leq t \leq 1 \\ -1 & \text{Para } -1 \leq t < 0 \\ 0 & \text{otro caso} \end{cases}$$

$$\mathcal{F}\{f(t)\} = \int_{-\infty}^{\infty} f(t)\, e^{-i\omega t}\, dt$$

$$= \cancel{\int_{-\infty}^{-1} f(t)\, dt} + \int_{-1}^{0} f(t)\, dt + \int_{0}^{1} f(t)\, dt + \cancel{\int_{1}^{\infty} f(t)\, dt}$$

$$= \int_{-1}^{0} (-1)\, e^{-i\omega t}\, dt + \int_{0}^{1} (1)\, e^{-i\omega t}\, dt$$

$$= -\int_{-1}^{0} e^{-i\omega t}\, dt + \int_{0}^{1} e^{-i\omega t}\, dt$$

$$= -\left[-\frac{1}{i\omega} e^{-i\omega t}\right]_{-1}^{0} + \left[-\frac{1}{i\omega} e^{-i\omega t}\right]_{0}^{1}$$

$$= \left[\frac{1}{i\omega} - \frac{1}{i\omega} e^{i\omega}\right] + \left[-\frac{1}{i\omega} e^{-i\omega t} + \frac{1}{i\omega}\right]$$

$$= \cancel{\frac{1}{i\omega}} - \frac{1}{i\omega} e^{i\omega} - \frac{1}{i\omega} e^{-i\omega} + \cancel{\frac{1}{i\omega}}$$

$$= \frac{2}{i\omega} - \frac{e^{-i\omega} + e^{i\omega}}{i\omega} \cdot \frac{2}{2} = \frac{2}{i\omega}\left(1 - \cos(\omega)\right)$$