Erinson Barrayo
16004336 HT#5 Mate VI

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

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

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

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

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

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

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

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

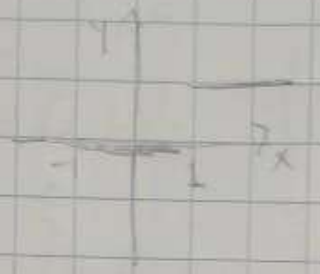
$$= \frac{2}{i\omega} - \frac{e^{-i\omega} + e^{i\omega}}{i\omega} \cdot \frac{2}{2} = \frac{2}{i\omega}\left(1 - \cos(\omega)\right)$$

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

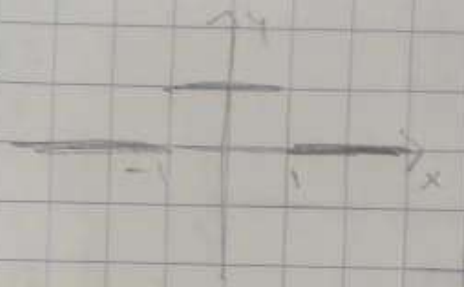
$$\mathcal{F}\{f(t)\} = \int_{-\infty}^{\infty} f(t)\, e^{-i\omega t}\, dt.$$

$H(t+1)$

$H(t-1)$



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



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

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

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

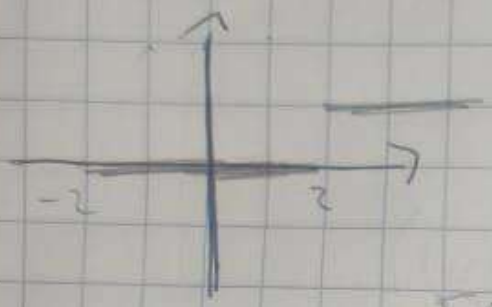
$$\frac{1}{it(3-\omega)} \left[e^{it(3-\omega)} - e^{it(3-\omega)} \right] \cdot \frac{2}{2}$$

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

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

① $\mathcal{F}\{f(t)\} = \int_{-\infty}^{\infty} f(t)\, e^{-i\omega t}\, dt =$

$H(t-2)$



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

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

$-t(3+i\omega)$

$\left[\frac{4}{3+i\omega}\right.$

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

Serie # 2

$$\hat{f}(w) = \frac{1}{3+iw}$$

$$\mathcal{F}\{u(t)e^{-at}\} = \frac{1}{a+iw}$$

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

$$\hat{f}(w) = \frac{10\sin(3w)}{w+\pi} = \frac{2(5)\,\mathrm{sen}(3w)}{w+\pi}$$

$$\frac{2(5)}{w+\pi}\,\mathrm{sen}\left[3\left(w+\pi-\pi\right)\right] + \frac{2(5)}{w+\pi}\,\mathrm{sen}\left[3\left(w+\pi\right)-3\pi\right]$$

$$f = \frac{10}{w}\,\mathrm{sen}(3w)$$

$$f(w-w_0) \qquad w = -\pi$$

$$\hat{f}(w-(-\pi)) = \frac{10}{w+\pi}\,\mathrm{sen}[3($$