1(a) $x(t) \begin{cases} 2, & -1 < t < 0 \\ 1, & 0 < t < 1 \\ 0, & 1 < t < 2 \end{cases}$ $C_0 = \frac{1}{3}\int_{-1}^{0} 2\,dt + \frac{1}{3}\int_{0}^{1} 1\,dt + \frac{1}{3}\int_{1}^{2} 0\,dt$

$C_0 = 1$ //

$$C_k = \frac{2}{3}\int_{-1}^{0} e^{-jk\frac{2\pi}{3}t}\,dt + \frac{1}{3}\int_{0}^{1} e^{-jk\frac{2\pi}{3}t}\,dt + \frac{1}{3}\int_{1}^{2} 0\,dt$$

$$C_k = \frac{2 - e^{-jk\frac{2\pi}{3}} - e^{-jk\frac{4\pi}{3}}}{jk2\pi}$$ //

$$C_k \cancel{z(t)} = \left\{2 - \left[\cos\left(-k\frac{2\pi}{3}\right) + j\sin\left(-k\frac{2\pi}{3}\right)\right] - \left[\cos\left(-k\frac{4\pi}{3}\right) + j\sin\left(-k\frac{4\pi}{3}\right)\right]\right\}\left\{\frac{1}{jk2\pi}\right\}$$

$$C_k \cancel{z(t)} = \frac{2 - \left[\cos\left(k\frac{2\pi}{3}\right) - j\sin\left(k\frac{2\pi}{3}\right)\right] - \left[\cos\left(k\frac{4\pi}{3}\right) - j\sin\left(k\frac{4\pi}{3}\right)\right]}{jk2\pi}$$ //

(b) $C_0 = \frac{1}{0.2}\left[\sum_{n=0.1}^{0.2} x(t)\, e^{-jk\frac{2\pi}{0.2}n}\right]$

$C_0 = \frac{1}{0.2}\left[(-1)\left(e^{-jk10\pi(-0.1)}\right) + (1)\left(e^{-jk10\pi(0)}\right) + (-2)\left(e^{-jk10\pi(0.1)}\right) + (1)\left(e^{-jk10\pi(0.2)}\right)\right]$

$= \frac{1}{0.2}\left[e^{jk\pi} + e^{-jk2\pi} - 2e^{-jk\pi} + 1\right]$ //

2a) $\frac{1}{T}\int x(t)\, e^{2\pi k k f_0 t}\, dt \; \cancel{+\int_{-2}^{3} e}$

$= \frac{1}{2}\left[\int_0^1 e^{-jk\frac{2\pi}{2}t}\, dt\right]$ let $\sigma = jk\pi t$

$d\sigma = jk\pi\, dt$

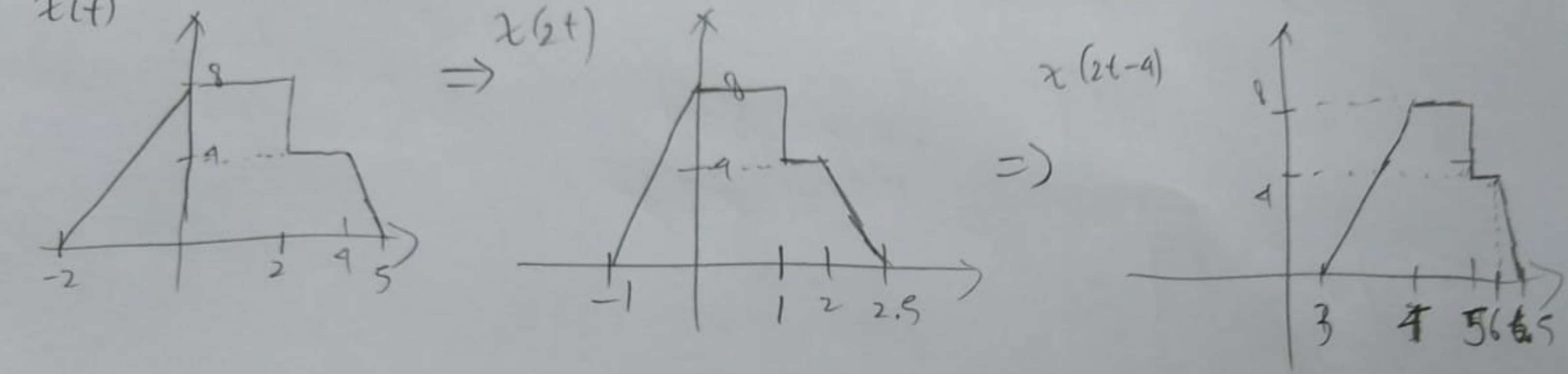
$= \frac{1}{2jk\pi}\left[e^{-jk\pi} - 1\right]$

$= \frac{e^{-jk\pi - 1}}{2jk\pi}$

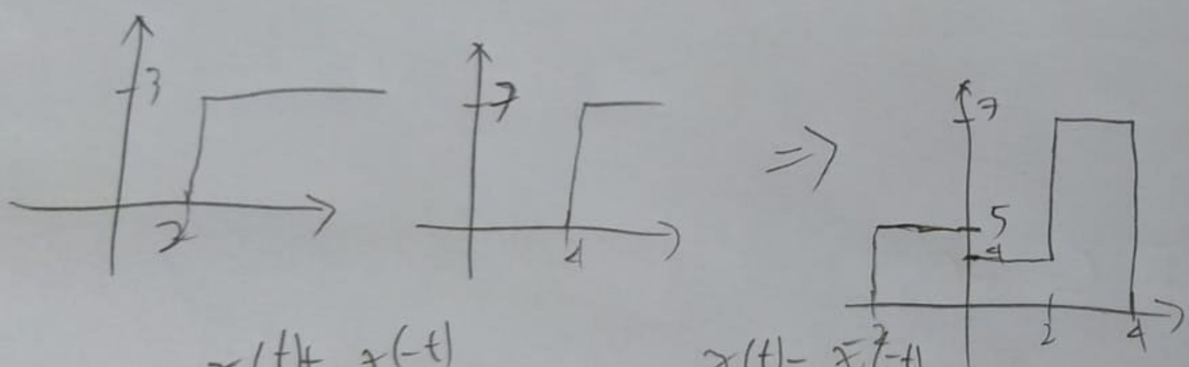
b) $x(t) = C_0 + C_1 + C_3 + C_{-3}$

$= 5 + \frac{1}{2}\left[e^{j\frac{\pi}{4}t} + e^{-j\frac{\pi}{4}t}\right]$

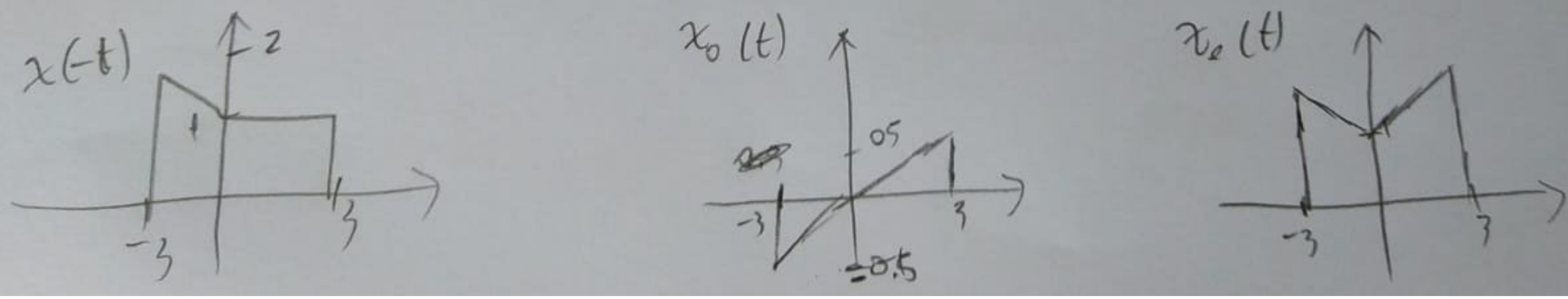
3a) $x(t)$



b)

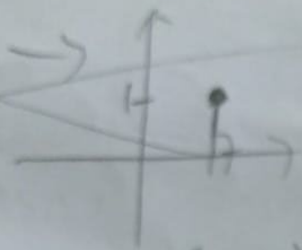


c) $x_e(t) = \dfrac{x(t) + x(-t)}{2}$ $\quad x_o(t) = \dfrac{x(t) - x(-t)}{2}$



~~4a) $y(t) = \delta(t-7)$~~

~~$h(t) = \frac{y(t)}{x(t)} =$~~



4a) ~~$h(t) = \int$~~ $y(t) = x(t-7)$

$h(t) = \delta(t-7) = \begin{cases} 1 & t = 7 \\ 0 & t \neq 7 \end{cases}$ Casual

b) $y(t) = \int_{-\infty}^{t} x(\tau-7)\,d\tau = \int_{-\infty}^{t} \delta(\tau-7)\,d\tau \begin{cases} 7 & t \leq -\infty \\ 0 & \text{otherwise} \end{cases}$

Causal

$\delta(t-7)$

c) $y(t) = \int_{\infty}^{t} \left[\int_{-\infty}^{\sigma} x(\tau-7)\,dt \right] d\sigma = \begin{cases} 7 & t \leq -\infty \\ 0 & \text{otherwise} \end{cases}$

$h(t) = u(t-7)$

causal

$\int_{-1}^{\infty} e^{t} < \infty$ →

5a) ~~No extra coefficients in t,~~ Stable

$\cancel{h(0) = e^{0} u(0) = (1)(1) = 1}$

$h(-1) = e^{-1} u(1) = e^{-1}$, non-causal

b) $h(-1) = e^{-1} u(-1) = 0$, causal

$\int_{0}^{\infty} e^{t} > \infty$ un-stable

c) $h(-1) = e^{-1} u(-2) = 0$, causal

$\int_{1}^{\infty} e^{-t} < \infty$ stable

d) $h(-1) = e^{-2} u(-2) = 0$ causal

$\int_{1}^{\infty} e^{t-1}$ not stable

e) $h(-1) = e^{-1} u(2) = e^{-1}$, non causal

$\int_{-\infty}^{-1} e^{t} < \infty$ stable

f) $\int \sin(t) = \tan(t)$, unstable $\tan(t) < \infty$ is not

$h(-1) = e^{-1} u(1) \sin(5) = e^{-1} \sin 5$, non causal

g) still unstable

$h(-1) = e^{-1} u(-1) \sin 5 = 0$, causal