① (a) $P = \frac{1}{2T}(x[n])^2$

$= \frac{1}{12}(9+1+4+25+4+1+9+1+4+25+4+1)$

$= 7.333$

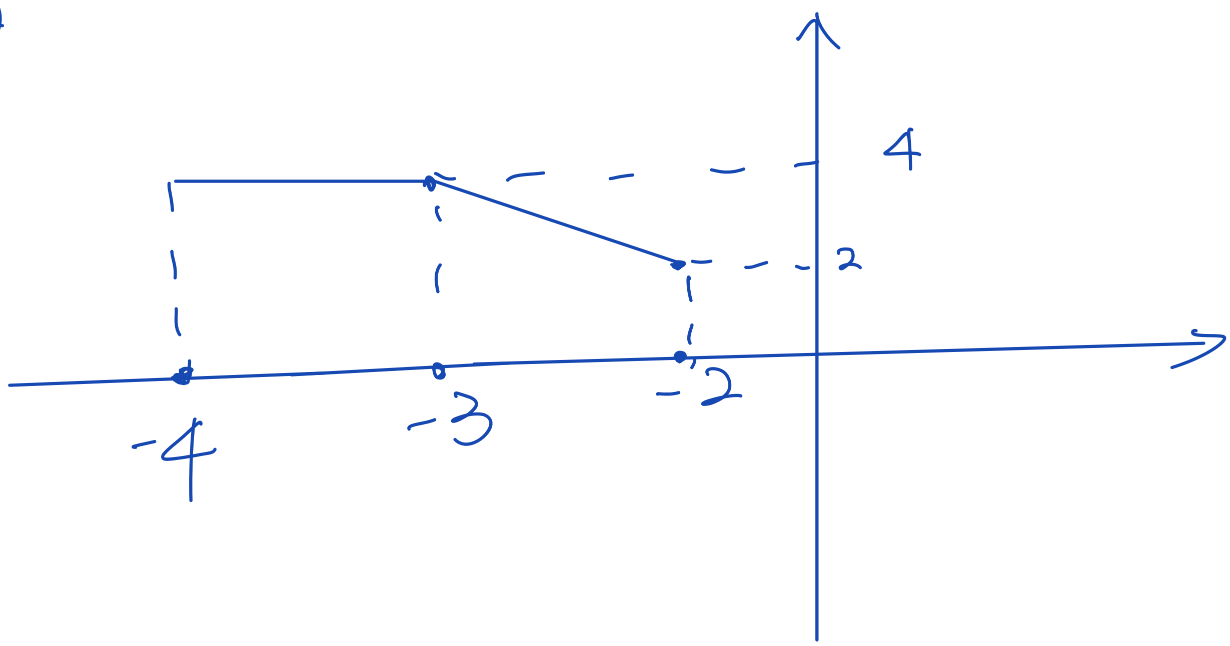
(b) $x[n] = A\delta[n]$

$E = \sum_{-\infty}^{\infty} |x[n]|^2 = A^2$

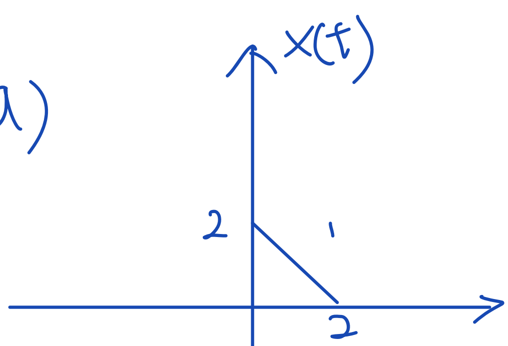
(c) $x[n] = 5(u[n+2] - u[n-1])$

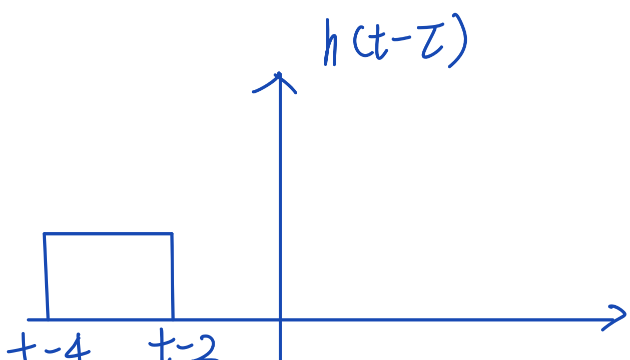
$E = \sum_{-\infty}^{\infty} |x[n]|^2 = 25 \cdot 4 = 100$

②



③ (a)





(b) ① $t-2\leq 0$ $t\leq 2$ $y(t)=0$

② $0<t-2<2$ $2<t\leq 4$ $y(t)=\int_0^{t-2}(-\tau+2)\,d\tau$

$$=2x-\frac{x^2}{2}\Big|_0^{t-2}$$

$$=2(t-2)-\frac{(t-2)^2}{2}$$

③ $\cancel{6}>t>4$ $y(t)=\int_{t-4}^{2}(-\tau+2)\,dt = 2x-\frac{x^2}{2}\Big|_{t-4}^{2}$

$y(t)$

$-$

$$=2-2(t-4)+\frac{(t-4)^2}{2}$$

④(a) $y[n]=T\{x[n]\}=\begin{cases}(-2)^n x[n] & x[n]\geq 0\\ 4x[n] & x[n]<0\end{cases}$

memoryless output depend on $x[n]$

causal and it's real time system

$T\{\alpha x_1[n]+\beta x_2[n]\}=\{(-2)^n\alpha x[n]+(-2)^n\beta x_2[n]$

$$\left\{ 4\alpha x_1[n] + 4\beta_2[n] \right.$$

$= \alpha y_1[n] + \beta y_2[n]$ linear.

$$T\{x[n-n_0]\} = \begin{cases} (-2)^n x[n-n_0] & x[n] \geq 0 \\ 4x[n-n_0] & x[n] < 0 \end{cases}$$

$$y(n-n_0) = \begin{cases} (-2)^n x[n-n_0] & x[n-n_0] \geq 0 \\ 4x[n-n_0] & x[n-n_0] < 0 \end{cases}$$

time-variant

(b) $y[n] = T\{x[n]\} = \sum_{k=-\infty}^{n+1} x[k]$

not memoryless $y[n]$ depend on $x[k]$ instead of $x[n]$

not causal since the upper boudary is $n+1$ which means future time

$$T\{\alpha x_1[n] + \beta x_2[n]\} = \sum_{k=-\infty}^{n+1} \alpha x_1[k] + \beta x_2[k]$$

$$= \alpha y_1[n] + \beta y_2[n]$$

linear

$$T\{x[n-n_0]\} = \sum_{k=-\infty}^{n+1} x[k-n_0]$$

$$y[n-n_0] = \sum_{k=-\infty}^{n-n_0+1} x[k]$$ time variant