13 (a) $|x_1(t)|^2 = e^{-4t}u^2(t)$

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$E_\infty = \lim_{T\to\infty}\int_{-T}^{T} e^{-4t}u^2(t)dt = \lim_{T\to\infty}\int_0^T e^{-4t}dt$

$= -\frac{1}{4}e^{-4t}\Big|_0^{+\infty} = \frac{1}{4}$

$\therefore P_\infty = \lim_{T\to\infty}\frac{1}{2T}\int_{-T}^{T} e^{-4t}u^2(t)dt = \lim_{T\to\infty}\frac{1}{8T} = 0$

(b) $|x_2(t)|^2 = |e^{j(2t+\frac{\pi}{4})}|^2 = 1$

$E_\infty = \lim_{T\to\infty}\int_{-T}^{T} 1\, dt = \infty$ $\quad P_\infty = \lim_{T\to\infty}\frac{1}{2T}\int_{-T}^{T} 1dt = 1$

(c) $|x_3(t)|^2 = \cos^2 t$

$E_\infty = \lim_{T\to\infty}\int_{-T}^{T}\cos^2 t dt = \frac{1}{2}\lim_{T\to\infty}\int_{-T}^{T} 1+\cos 2t dt$

$= \frac{1}{2}\lim_{T\to\infty} 2T + \frac{1}{4}\lim_{T\to\infty}\sin 2t\Big|_{-T}^{T}$

$= \lim_{T\to\infty}(T + \frac{1}{2}\sin 2T) = \infty$

$P_\infty = \lim_{T\to\infty}\frac{1}{2T}\int_{-T}^{T}\cos^2 t dt$

$= \frac{1}{2}$

(d) $\{x_1[n]\}^2 = (\frac{1}{2})^{2n}\{u[n]\}^2$

$\therefore E_\infty = \lim_{N\to\infty}\sum_{n=-\infty}^{+\infty}(\frac{1}{2})^{2n}\{u[n]\}^2 = \frac{(1-\frac{1}{4}^n)}{1-\frac{1}{4}} = \frac{3}{4}$

$P_\infty = \lim_{N\to\infty}\frac{1}{2N+1}\sum_{n=-\infty}^{+\infty}(\frac{1}{2})^{2n}\{u[n]\}^2 = 0$

(e) $|x_2[n]|^2 = 1.$

$\therefore E_\infty = \lim_{N\to\infty}\sum_{n=-\infty}^{+\infty} 1 = \infty.$ $\quad N$

$P_\infty = \lim_{N\to\infty}\frac{1}{2N+1}\sum_{n=-\infty}^{+\infty} 1 = 1$ $\quad N$ $\quad = \frac{2N+1}{2N+1} = 1$

1.3 (1) $E_\infty = \lim_{T\to\infty}\int_{-T}^{T} |x(t)|^2 dt \quad P_\infty = \lim_{T\to\infty} \frac{1}{2T}\int_{-T}^{T} |x(t)|^2 dt$

$x_1(t) = e^{-2t}u(t) \quad |x_1(t)|^2 = \boxed{e^{-4t}}$ 有模实信号

$\because E_\infty = \lim_{T\to\infty}\int_0^T \cancel{1} dt . = \infty \quad P_\infty = \frac{1}{2T} \quad T = \frac{1}{2}$

$\lim_{T\to\infty}\int_0^T e^{-4t} dt = -\frac{1}{4}(0-1) = \frac{1}{4} \quad P_\infty = 0$

能信号

(2) $x_2(t) = e^{j(2t+\frac{\pi}{4})}$

$|x_2(t)|^2 = 1$

$\because E_\infty = \lim_{T\to\infty}\int_{-T}^{T} 1 dt . = \infty \quad P_\infty = \lim_{T\to\infty}\frac{1}{2T}\int_{\cancel{-T}}^{T} 1 dt = 1$

(3). $x_3(t) = \cos(t)$

$|\cos(t)|^2 = \cos^2 t$

$E_\infty = \lim_{T\to\infty}\int_{-T}^{T}\cos^2 t dt = \lim_{T\to\infty}\int_{-T}^{T}\frac{1+\cos 2t}{2} dt = \infty.$

$P_\infty = \lim_{T\to\infty}\frac{1}{2T}\int_{-T}^{T}\left(\frac{1}{2}+\frac{1}{2}\cos 2t\right)dt$

$= \frac{1}{2} + \lim_{T\to\infty}\frac{1}{2T}\underbrace{\cdot\frac{1}{2}\cdot\frac{\sin 2t}{2}\Big|_{-T}^{T}} = \frac{1}{2}$

这个求信号能量&功率题，只需要熟公式，按部就班积分

(f) $x_3^2[n] = \frac{1}{2}(1+\cos\frac{\pi}{2}n)$

$E_\infty = \frac{1}{2}\lim_{N\to\infty}\sum_{n=-\infty}^{+\infty}(1+\cos\frac{\pi}{2}n) = \infty$ $\quad P_\infty = \lim_{N\to\infty}\frac{1}{2N+1}\sum_{n=-\infty}^{+\infty}\frac{1}{2}(1+\cos\frac{\pi}{2}n) = \frac{1}{2}$

↘ 求完和就0.

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1.4 (a). $n-3<-2$ 或 $n-3>4$

$n<1$ 或 $n>7$.

$n=-m$ 或 $m+8$ $(m\in N)$

(b) $n+4<-2$ 或 $n+4>4$

得 $n<-6$ 或 $n>0$

$n=-7-m$ 或 $n=m+1$ $(m\in N)$

(c) $-n<-2$ 或 $-n>4$

$n>2$ 或 $n<-4$

$\therefore n=m+3$ 或 $-5-m$ $(m\in N)$

(d) $-n+2<-2$ 或 $-n+2>4$

$n>4$ 或 $n<-2$

$n=5+m$ 或 $-3-m$ $(m\in N)$

(e) $-n-2<-2$ 或 $-n-2>4$

$n>0$ 或 $n<-6$.

$\therefore n=m+1$ 或 $-7-m$ $(m\in N)$

1.5 (a). $1-t<3$ $\therefore t>-2$.

(b) 要求 $\begin{cases}1-t<3\\2-t<3\end{cases} \Rightarrow \begin{cases}t>-2\\t>-1\end{cases}$ $\therefore t>-1$

(c). 要求 $1-t<3$ 或 $2-t<3$ (至少满足其一)

$t>-2$ 或 $t>1$.

∴ 取 $t>-2$

(d) 得 $3t<3$ ∴ $t<1$

(e) $t/3<3$ ∴ $t<9$

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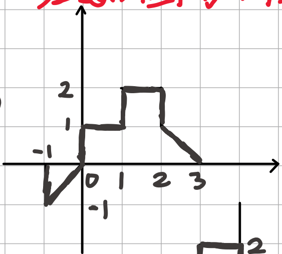
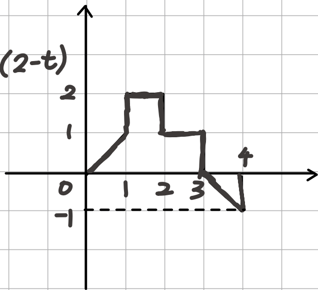
1.21 注意. 图像尺度变换

(a)

$x(t-1)$ 右移1个单位

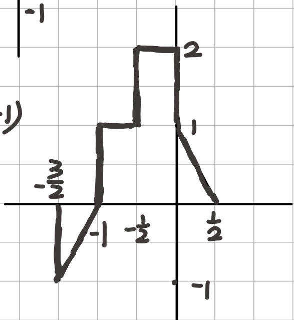


(b) $x(2-t)$ 左2后反转

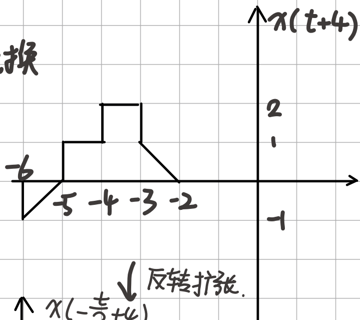


(c) $x(2t+1)$ 左1后尺度变换

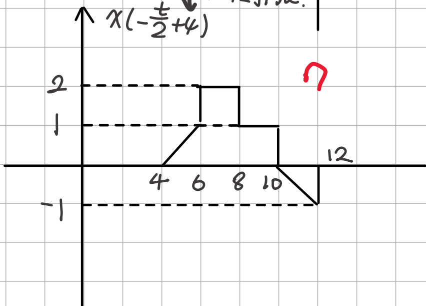
(c)



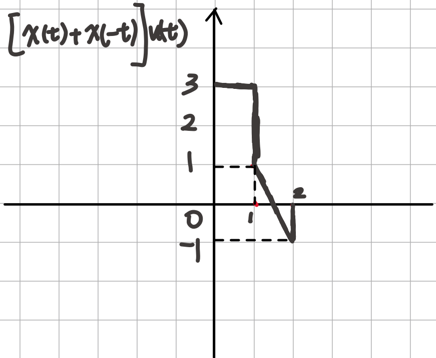
(d) $x(4-\frac{t}{2})$ 左4后尺度变换



反转扩张.



(e). $[x(t)+x(-t)]u(t)$



(a). $x(t-1)$ 右移1

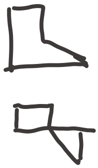
(b) $x(2-t) \Rightarrow x(t) \xrightarrow{\text{左2}} x(t+2) \xrightarrow{\text{反转}} x(-t+2)$

(c) $x(t) \xrightarrow{\text{左1}} x(t+1) \xrightarrow{\frac{1}{2}\text{倍尺}} x(2t+1)$

(d) $x(t) \xrightarrow{\text{左4}} x(t+4) \xrightarrow{\text{扩2}} x(\frac{t}{2}+4) \xrightarrow{\text{反}} x(-\frac{t}{2}+4)$

$\xrightarrow{\text{扩2}} x(\frac{t}{2}) \xrightarrow{\text{左8}} x(\frac{t+8}{2}) \xrightarrow{\text{反}} x(-\frac{t}{2}+4)$

(e) $x(t)\,u(t)$
$+$
$x(-t)\,u(t)$



(f) $\underbrace{x(t)\,[\delta(t+\frac{3}{2})}\ -\ \delta(t-\frac{3}{2})]$

$x(-\frac{3}{2}) \ - \ x(+\frac{3}{2})$

(f) $x(t)\delta(t+\frac{3}{2}) = x(-\frac{3}{2})\delta(t+\frac{3}{2})$.

$-x(t)\delta(t-\frac{3}{2}) = -x(\frac{3}{2})\delta(t-\frac{3}{2})$

图像仅为$(-\frac{3}{2},-\frac{1}{2})$

$(\frac{3}{2},\frac{-1}{2})$ 2点、