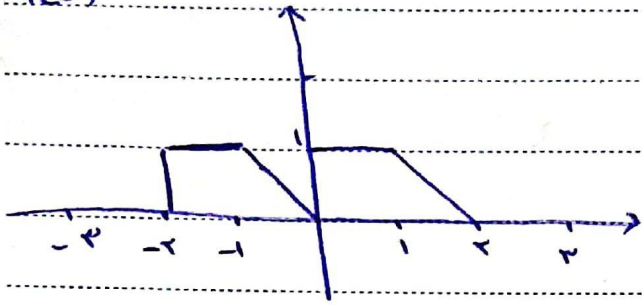


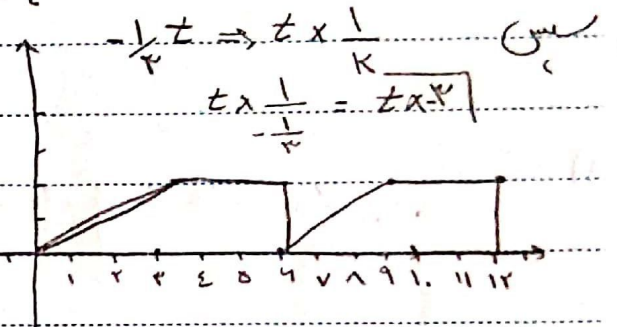
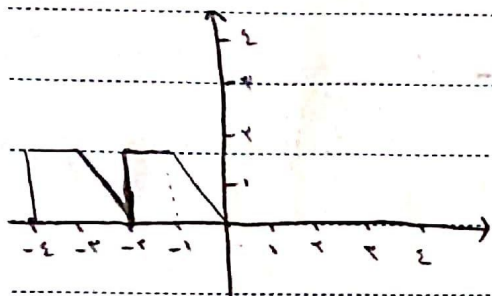
۱- رسم و انوار خواصه سه

$h(t)$



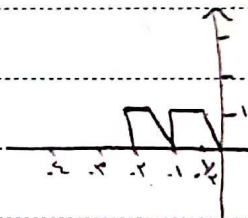
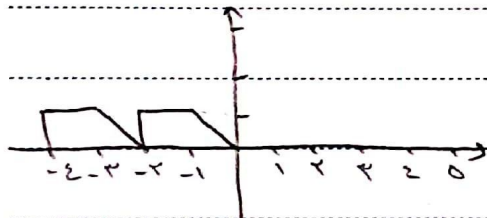
۱- $x(t - t/p) \rightarrow x(-1/p t + 2)$

البتا سيفت ۲ و انواره دو واره مستجاب



۲- $x(2t + 2)$

البتا سيفت ۲ و انواره دو واره مستجاب



يس $2t \rightarrow t x 1/K$

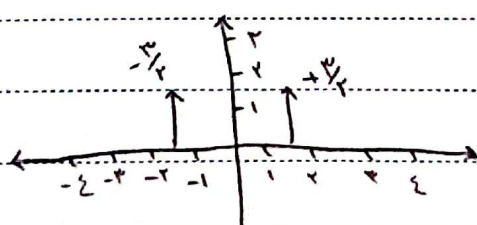
$t x 1/K$

۳- $x(t) \{ \delta(t + 3/4) + \delta(t - 3/4) \} \Rightarrow x(t) \delta(t + 3/4) + x(t) \delta(t - 3/4)$

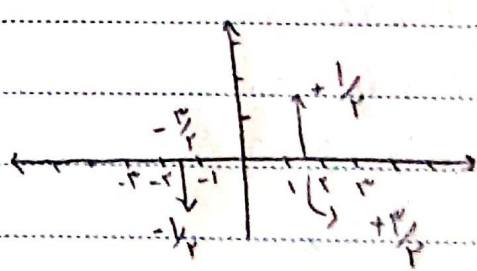
$x(t) \delta(t - t_0) = x(t_0) \delta(t - t_0)$

$x(-3/4) \delta(t + 3/4) + x(3/4) \delta(t - 3/4)$

ميدانيم:

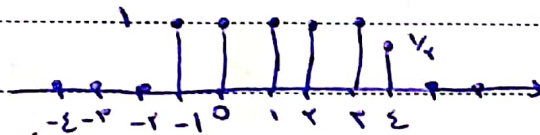


\Rightarrow



$$x[n] = \alpha(n+1)u(n - \frac{1}{4})$$

$$1) x[n]$$



رسم ساقه وارتفاعه

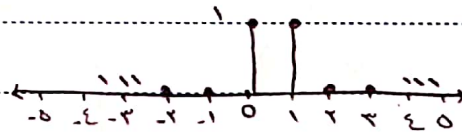
$$n=0 \rightarrow x[0] = 1 \checkmark$$

$$n=-1 \rightarrow x[-1] = 0 \checkmark$$

$$n=1 \rightarrow x[1] = 1 \checkmark$$

$$n=2 \rightarrow x[2] = 0 \checkmark$$

$$n=-2 \rightarrow x[-2] = 0 \checkmark$$



$$2) x[n-4]$$

$$n=0 \rightarrow x[-4] = 0$$

$$n=1 \rightarrow x[-3] = 0$$

$$n=-1 \rightarrow x[-5] = 0$$

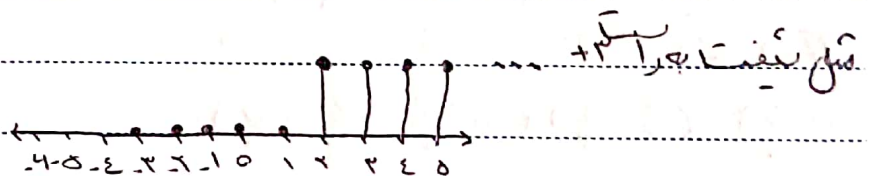
$$n=2 \rightarrow x[-2] = 1$$

$$n=-2 \rightarrow x[-6] = 0$$

$$n=3 \rightarrow x[-1] = 1$$

$$n=-3 \rightarrow x[-7] = 0$$

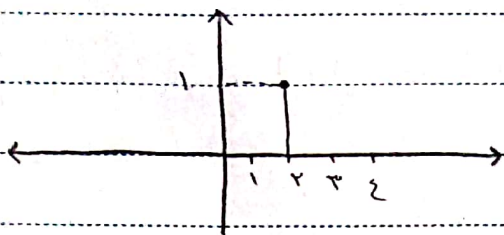
$$n=4 \rightarrow x[0] = 1$$



$$x[n-2] \delta[n-2]$$

$$n-2=0 \rightarrow n=2$$

شیفت در واحد ۲



$$x[n/4]$$

$$n=0 \rightarrow x[0] = 1$$

$$n=1 \rightarrow x[1/4] = 0$$

$$n=-1 \rightarrow x[-1/4] = 0$$

$$n=2 \rightarrow x[1/2] = 1$$

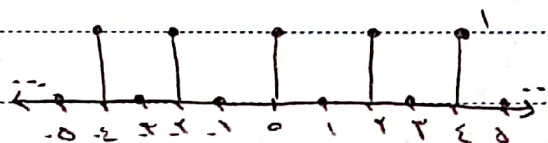
$$n=-2 \rightarrow x[-1/2] = 1$$

$$n=3 \rightarrow x[3/4] = 0$$

$$n=-3 \rightarrow x[-3/4] = 0$$

$$n=4 \rightarrow x[1] = 1$$

$$n=-4 \rightarrow x[-1] = 0$$



$$x[(n-1)^2]$$

$$n=0 \rightarrow x[1] = 1$$

$$n=-1 \rightarrow x[4] = 1/4$$

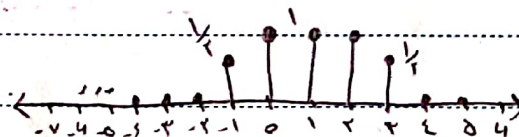
$$n=1 \rightarrow x[0] = 1$$

$$n=2 \rightarrow x[1] = 1$$

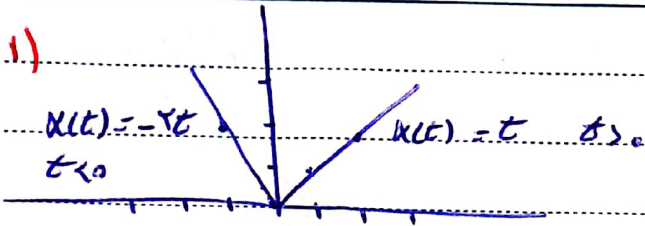
$$n=-2 \rightarrow x[9] = 0$$

$$n=3 \rightarrow x[4] = 1/4$$

$$n=-3 \rightarrow x[16] = 0$$



1)

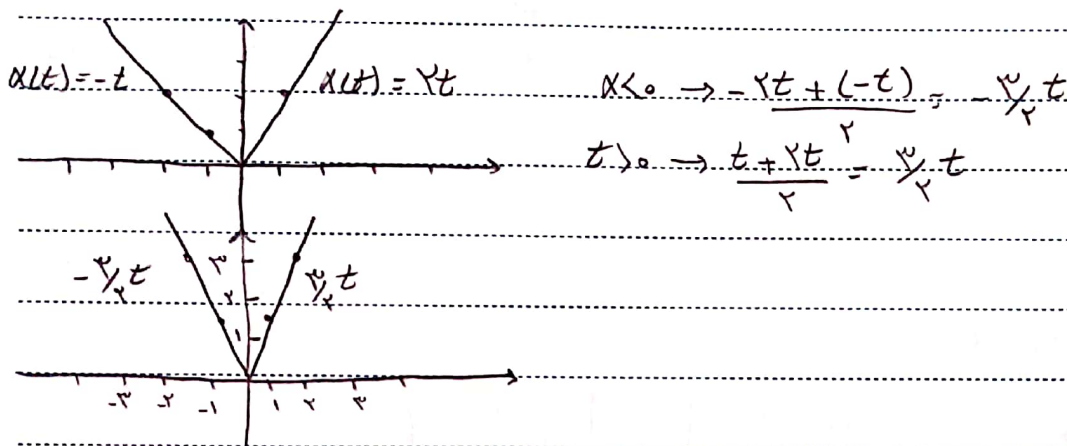


۳. زوج و فرد را رسم کنید

می دانیم که می توان هر سیگنالی را به صورت مجموع زوج و فرد نوشت

$$E\{x(t)\} = \frac{x(t) + x(-t)}{2} \quad \text{بخش زوج}$$

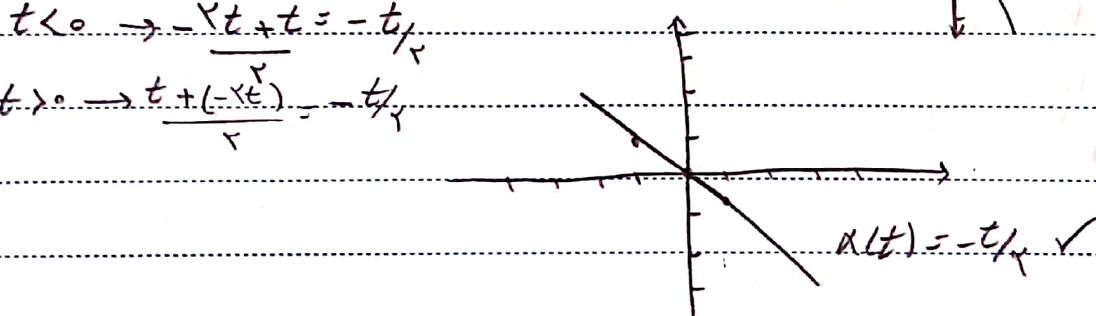
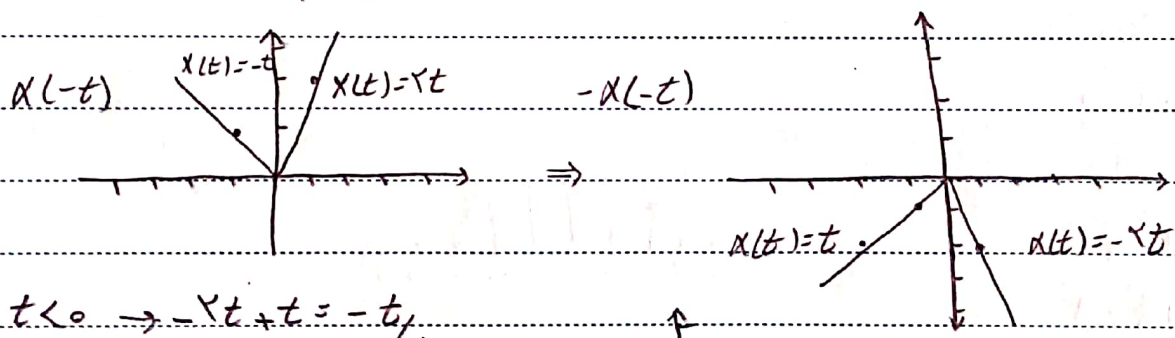
کافی $x(t)$ را نسبت به t معکوس کنیم تا $x(-t)$ حاصل شود.



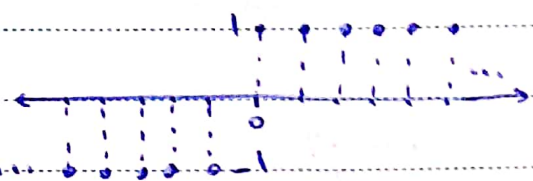
$$od\{x(t)\} = \frac{x(t) - x(-t)}{2}, \quad x(t) + [-x(-t)]$$

بخش فرد

برای $x(-t)$ کافی است $x(t)$ را نسبت به محور t معکوس کنیم تا $-x(-t)$ حاصل شود

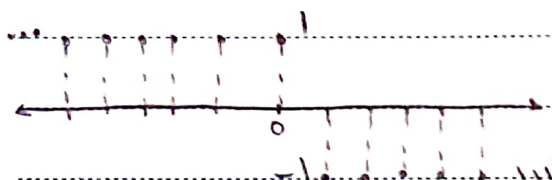


۲)

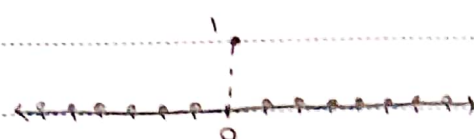


$$\sum \{x[n]\} \rightarrow \frac{x[n] + x[-n]}{2}$$

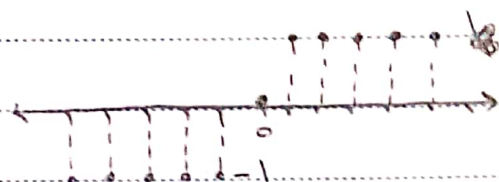
کدام است $x[n]$ و $x[-n]$ و $\frac{x[n] + x[-n]}{2}$ و $\frac{x[n] - x[-n]}{2}$ را بنویسید



$$\frac{x[n] + x[-n]}{2}$$



$$\frac{x[n] - x[-n]}{2}$$



۳. مثال متلازم در دو تابع را بنویسید

$$a) x(t) = e^{(-j + \sin(\frac{\pi}{4}))t} = e^{-jt} + e^{t \sin \frac{\pi}{4}} \rightarrow e^{-j(t+T)} + e^{(t+T) \sin \frac{\pi}{4}}$$

$$e^{-jt - jT + T + t} \rightarrow e^{t(-j+1) + T(-j+1)} \rightarrow T = \frac{2\pi}{j+1} \checkmark$$

$$b) x(t) = \cos(\sqrt{2}t + 1) \rightarrow \cos(\sqrt{2}(t+T) + 1) = \cos(\sqrt{2}t + \sqrt{2}T + 1) \Rightarrow T = \frac{2\pi}{\sqrt{2}} \checkmark$$

$$c) [\cos(\sqrt{2}t - \frac{\pi}{4})] \rightarrow \cos(\sqrt{2}(t+T) - \frac{\pi}{4}) = \cos(\sqrt{2}t + \sqrt{2}T - \frac{\pi}{4}) \Rightarrow T = \frac{2\pi}{\sqrt{2}}$$

$$d) x[n] = e^{-j\frac{\pi}{4}n} + e^{j\frac{\pi}{4}n} \Rightarrow e^{-j\frac{\pi}{4}(n+N)} + e^{j\frac{\pi}{4}(n+N)} = e^{-j\frac{\pi}{4}n} + e^{j\frac{\pi}{4}n} \Rightarrow e^{-j\frac{\pi}{4}N} + e^{j\frac{\pi}{4}N} = 1$$

$$e) x(t) = \sin \frac{\pi}{4}t + \cos \frac{\pi}{4}t \rightarrow \sin \frac{\pi}{4}(t+T) + \cos \frac{\pi}{4}(t+T) \Rightarrow T = 2\pi$$

$$f) x[n] = u[n] - u[-n] \rightarrow u[n+N] - u[-(n+N)] = u[n+N] - u[-n-N]$$

$$N = 2\pi \checkmark$$

$$g) x[n] = e^{\frac{j\pi n}{8}} \Rightarrow e^{\frac{j\pi}{8}(n+\frac{1}{10})} = e^{\frac{j\pi n}{8} + \frac{j\pi}{80}} = e^{\frac{j\pi}{8}(n+N)} + e^{\frac{j\pi}{80}} \Rightarrow e^{\frac{j\pi n}{8}} + e^{\frac{j\pi N}{8}} + e^{\frac{j\pi}{80}} = e^{\frac{j\pi n}{8}} + e^{\frac{j\pi N}{8}} + e^{\frac{j\pi}{80}}$$

$$\frac{j\pi N}{8} \rightarrow N = \frac{10\pi}{j\pi} \rightarrow e^{\frac{j\pi n}{8} + \frac{j\pi}{10}} \rightarrow e^{\frac{j\pi n}{8}} + e^{\frac{j\pi N}{8}} + e^{\frac{j\pi}{10}} \Rightarrow N = \frac{10}{j}$$

$$h) x[n] = e$$

$$N = -10j$$

8 $y[n], y(t) \leftrightarrow x[n] \rightarrow N=3 \quad x(t) \rightarrow T=0.5$

$$y[n] = x\left[\frac{n}{2}\right] + x[n]$$

4- انرژی و توان کل

$$x(t) = \begin{cases} re^{j(t+\tau)-t} & t \geq 0 \\ 0 & t < 0 \end{cases}$$

$$E = \int_0^{\infty} |re^{j(t+\tau)-t}|^2 dt \rightarrow \infty \quad P_{\infty} = \frac{E_{\infty}}{\tau} = 1$$

$$x[n] = \begin{cases} \left(\frac{1}{r} + j\sqrt{\frac{\tau}{r}}\right)^n & n \geq 0 \\ 0 & n < 0 \end{cases}$$

$$E = \sum_{n=0}^{\infty} \left| \left(\frac{1}{r} + j\sqrt{\frac{\tau}{r}}\right)^n \right|^2 = 1 + \frac{1}{r} + j\sqrt{\frac{\tau}{r}} = \frac{r}{r} + j\sqrt{\frac{\tau}{r}}$$

$$P = \frac{1}{rN+1} \sum_{n=0}^{\infty} \left| \left(\frac{1}{r} + j\sqrt{\frac{\tau}{r}}\right)^n \right|^2 = \left(\frac{1}{r} + 1 + j\sqrt{\frac{\tau}{r}}\right) \frac{1}{rN+1} \Rightarrow \frac{r + j\sqrt{\tau}}{r}$$

$$a) \delta[n^2 - n] = \delta[n] + \delta[n+1]$$

۷. اثبات تساوی ۸

$$\delta[n(n-1)] = \delta[n] + \delta[n-1]$$

$$b) u[-2n-1] = u[-n-1]$$

$$u[n] = u[kn]$$

$$c) \sum_{n=2}^{\infty} \sin \frac{\pi}{4} n \delta[n-1] = 0$$

چون تابع $\delta[n-1]$ در بازه مذکور نیست مقدار آن صفر است
پس کلی مقادیر و جمع آنها نیز صفر است.

$$n=2 \rightarrow \sin \frac{\pi}{4} \delta[1] = 0$$

$$n=3 \rightarrow \sin \frac{\pi}{4} \delta[2] = 0$$

$$d) \sum_{k=-\infty}^{\infty} \delta[n+1-k] = u[n-2]$$

$$n=3 \rightarrow \delta[n-2]$$

$$k=-4 \rightarrow \delta[n-3] \Rightarrow \delta[n-2] + \delta[n-3] + \delta[n-4] + \dots = u[n-2]$$

$$k=0 \rightarrow \delta[n-1] \quad \delta[n] = u[n] - u[n-1]$$

$$\delta[n-2] = u[n-2] - u[n-3] \quad \checkmark$$

$$e) \int_{0}^5 \omega^2 \delta(2\omega-4) d\omega = \frac{9}{4} [u(t-2) - u(t-1)]$$