A discrete-time signal is shown in the figure, Sketch and label carefully each of the following signals:
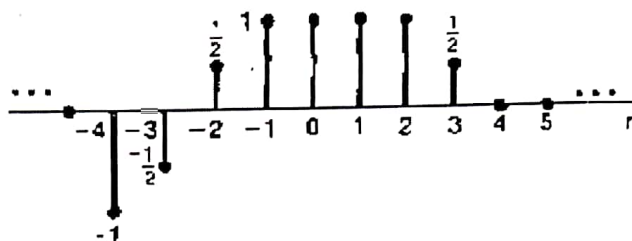
a- $X[n-4]$

b- $X[3-n]$

c- $X[3n]$

d- $X[3n+1]$
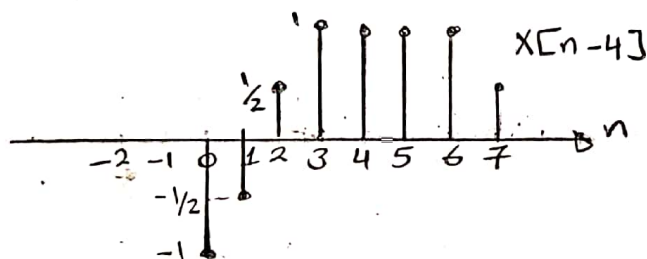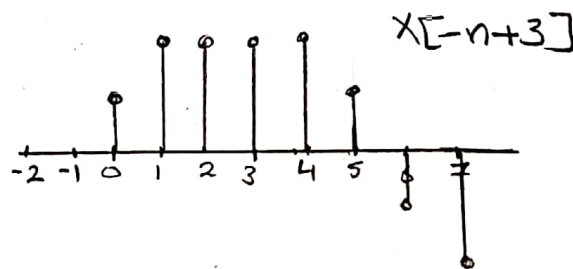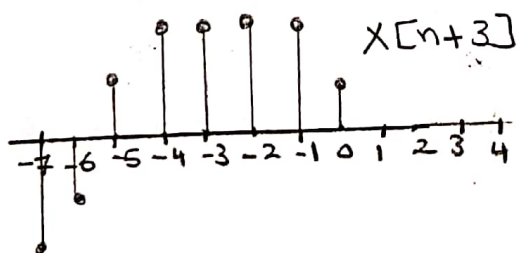
e- $X[n]u[3-n]$

f- $X[n-2]\delta[n-2]$

g- $\frac{1}{2}X[n]+\frac{1}{2}(-1)^n x[n]$

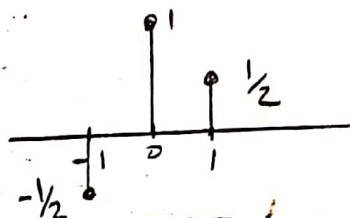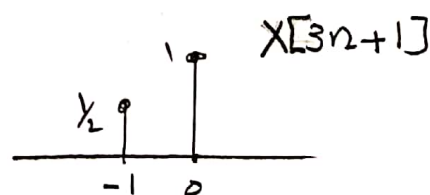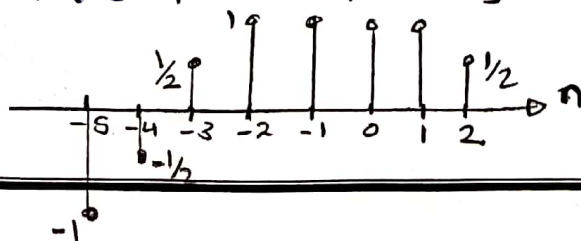(a) $X[n+4]$ ⟶ increase the indep var. by $+4$

$X[n-4]$

(b) $X[3-n] = X[-n+3]$

$X[n+3]$

$X[-n+3]$

(c) $X[3n]$ ⟶ Divide ind. var of $X[n]/3$
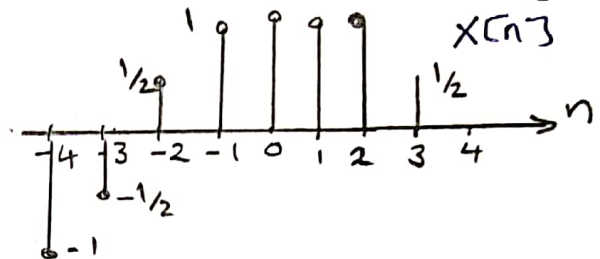

(d) $X[3n+1]$ $X[n+1]$ $X[3n+1]$
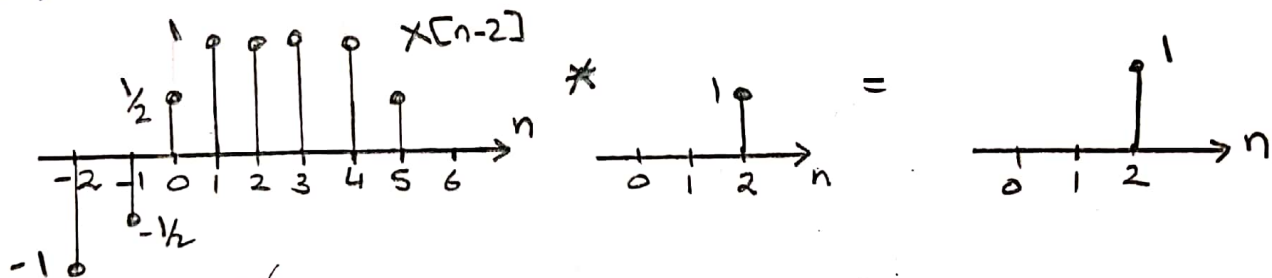
(e) $x[n] \cup [3-n] = x[n] \cup [-n+3]$
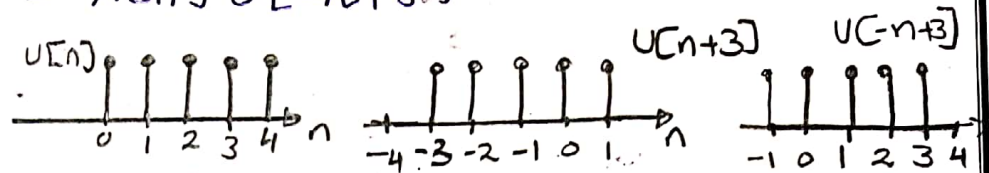
by Multipling $x[n] \cdot \cup [3-n] \to x[n]$ will be defined only with
       n values $[3 \to -\infty]$

     which is the original $x[n]$

(f) $x[n-2] \, \delta[n-2]$

(g) $\frac{1}{2} x[n] + \frac{1}{2} (-1)^n x[n]$
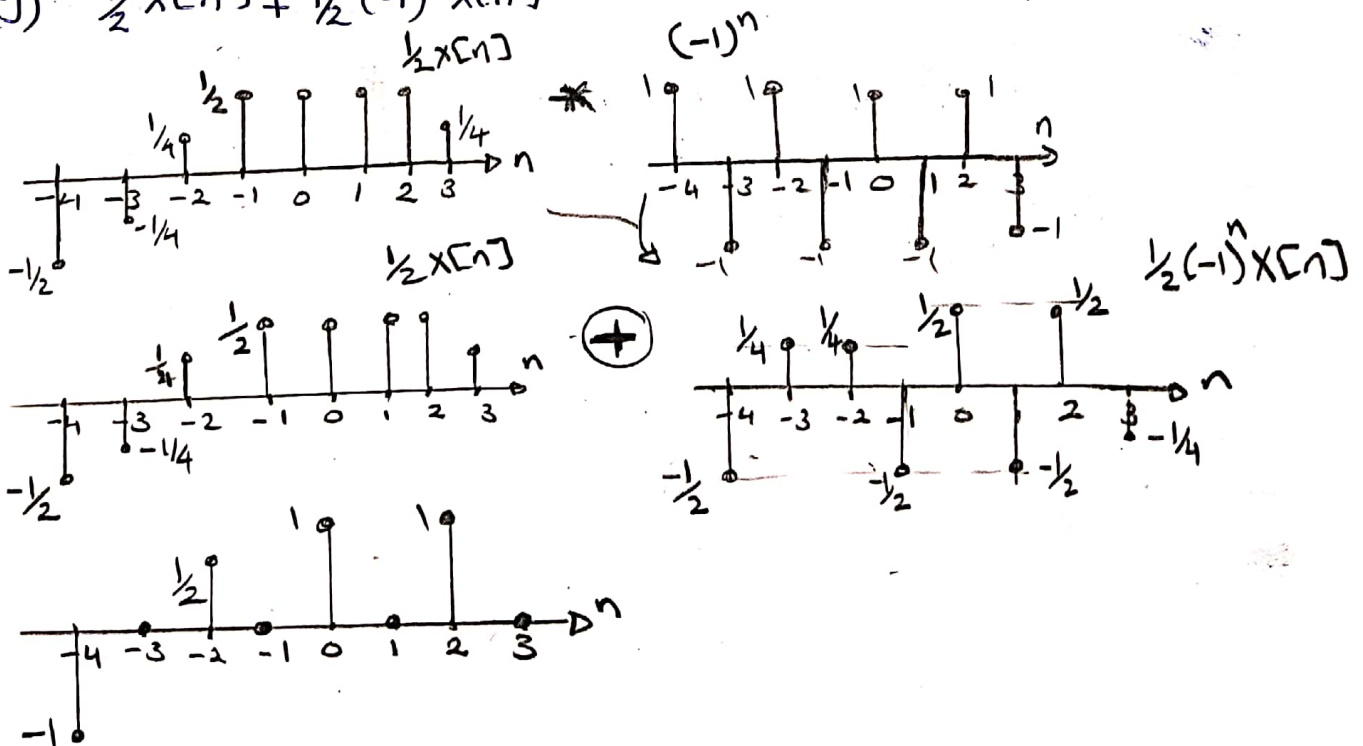
Determine and sketch the even and odd parts of the signals in following figures, label your sketches carefully.

$\frac{1}{2}X[n]$

$\frac{1}{2}X[-n]$

$X_e[n]$

$X_o[n]$

add $X_e[n] + X_o[n]$ you will get back $X[n]$

Determine and sketch the even and odd parts of the signals in following figures, label your sketches carefully.

$\frac{1}{2}X[n]$

$\frac{1}{2}X[-n]$

$X_e[n]$

$-\frac{1}{2}X[-n]$
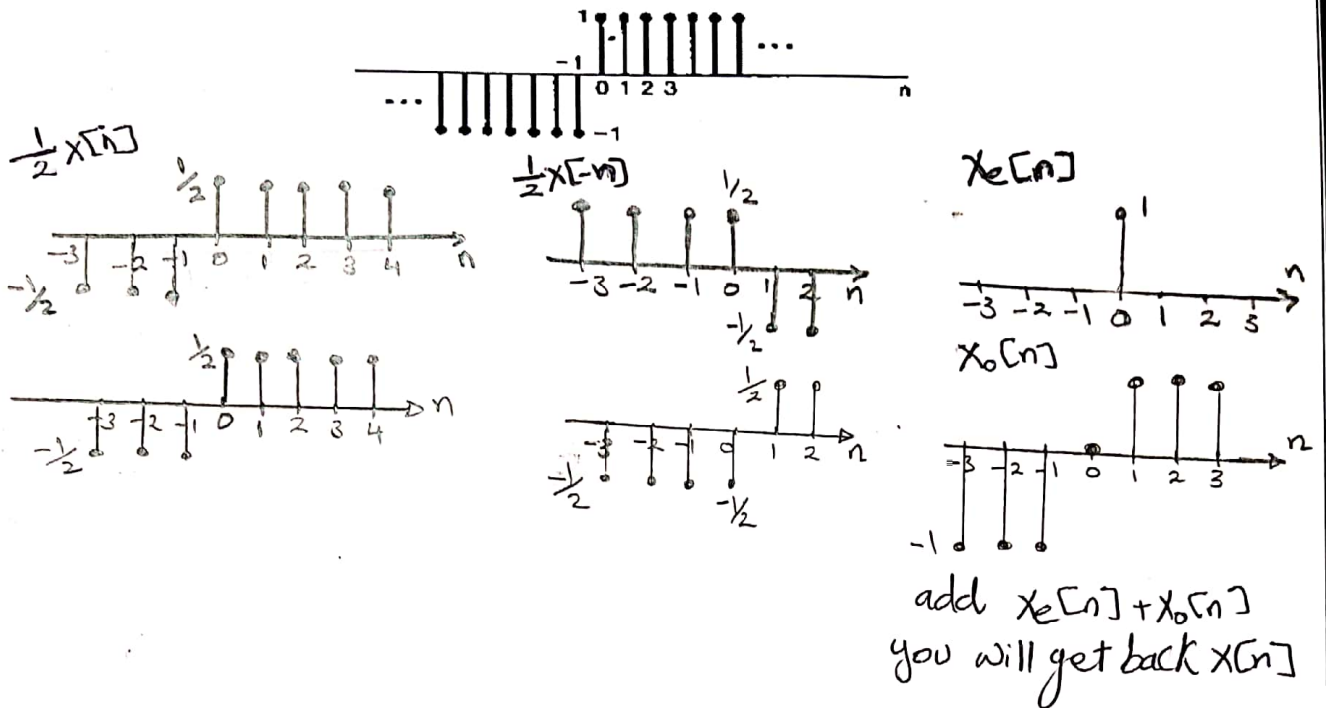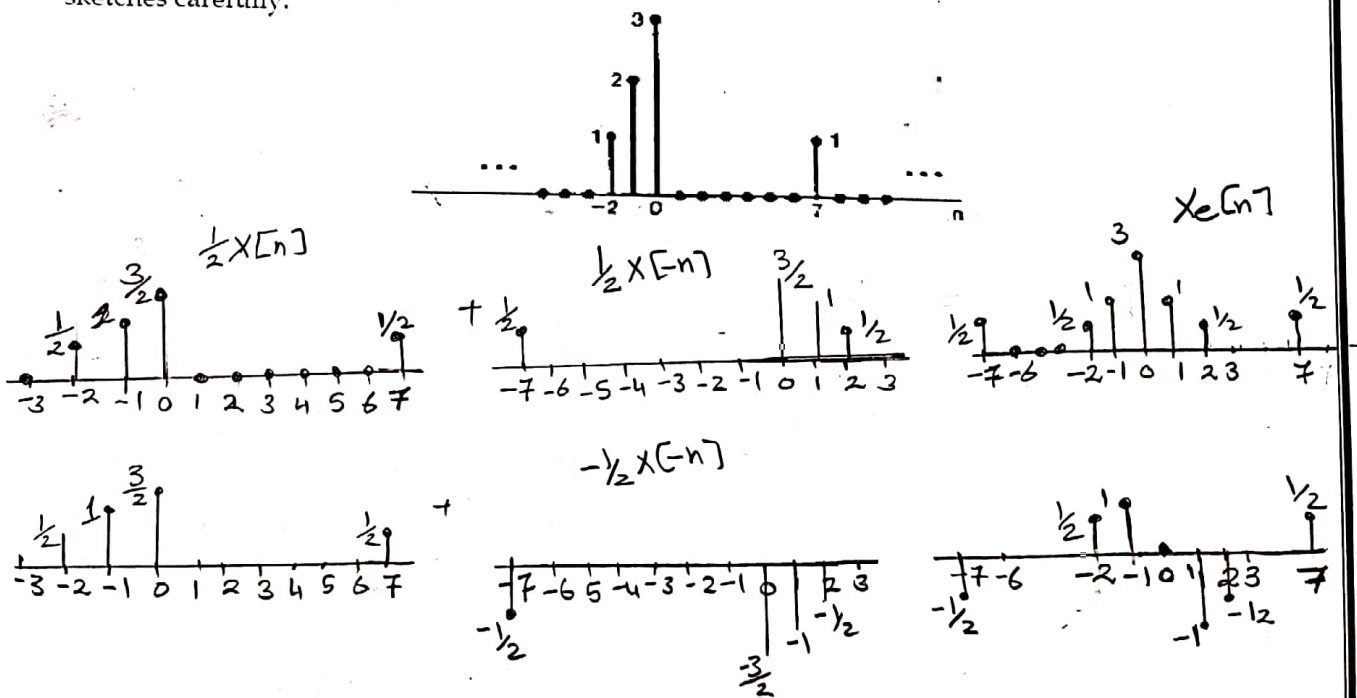
Determine whether the signal is periodic or not

a- $X[n] = \cos\left(\frac{8\pi}{7}n + 2\right)$

b- $X(t) = j\,e^{j10t}$

c- $X[n] = e^{j\frac{8\pi}{35}n}$

d- $X[n] = \sin(0.2n + \pi)$

e- $X(t) = 2e^{j\left(t+\frac{\pi}{4}\right)}u(t)$

(a) $X[n] = \cos\left(\frac{8\pi}{7}n + 2\right)$

$\frac{N}{m} = \frac{2\pi}{\omega} = \frac{2\pi}{\frac{8\pi}{7}} = \frac{14}{8} = \frac{7}{4}$ ∴ Signal is Periodic $N=7$ @ $m=4$

(b) $X(t) = j\,e^{j10t}$

Signal is periodic with fund. Period $T = \frac{2\pi}{\omega} = \frac{2\pi}{10} = \frac{\pi}{5}$

(c) $X[n] = e^{j\frac{8\pi}{35}n}$

$\frac{N}{m} = \frac{2\pi}{\omega} = \frac{2\pi}{\frac{8\pi}{35}} = \frac{35}{4}$ Signal is periodic with fund. Period
$N = 35$ @ $m=4$

(d) $X[n] = \sin(0.2n + \pi)$

$\frac{N}{m} = \frac{2\pi}{\omega} = \frac{2\pi}{0.2} = 10\pi$ irrational ∴ Signal is Aperiodic

(e) $X(t) = 2e^{j(t+\pi/4)}u(t)$

∵ Signal is noT Continous (repeated) over $-\infty$ to ∞ & defined only from $0 \rightarrow \infty$ ∴ Signal is Aperiodic