

∴ Quiz #1 SOLUTION:-

∴ SIGNAL & SYSTEMS:-

Q#18- $x(t) = 2\cos(10t+1) - \sin(4t-1)$

Determine whether or not the following signal is periodic. If a signal is periodic, specify its fundamental period.

Sol:-

Step#1: Calculate time period for $2\cos(10t+1)$ & $\sin(4t-1)$
Period of first term, i.e., $2\cos(10t+1)$

$$T_1 = \frac{2\pi}{\omega_0} \quad \therefore \omega_0 = 10$$

$$T_1 = \frac{2\pi}{10 \cdot 5} \Rightarrow \frac{\pi}{5}$$

Period of 2nd term, i.e., $\sin(4t-1)$

$$T_2 = \frac{2\pi}{\omega_0} \quad \therefore \omega_0 = 4$$

$$T_2 = \frac{2\pi}{4 \cdot 2} \Rightarrow \frac{\pi}{2}$$

Step#2: Check whether the ratio of T_1 and T_2 is rational.

$$\frac{T_1}{T_2} = \frac{\pi/5}{\pi/2} \times \frac{2}{\pi} \Rightarrow \frac{2}{5}$$

Hence, $x(t)$ is periodic as the ratio of T_1 and T_2 is rational.

Step#3: Now calculate the fundamental period of $x(t)$
i.e., T_0 :

$$T_0 = \text{LCM}(T_1, T_2)$$

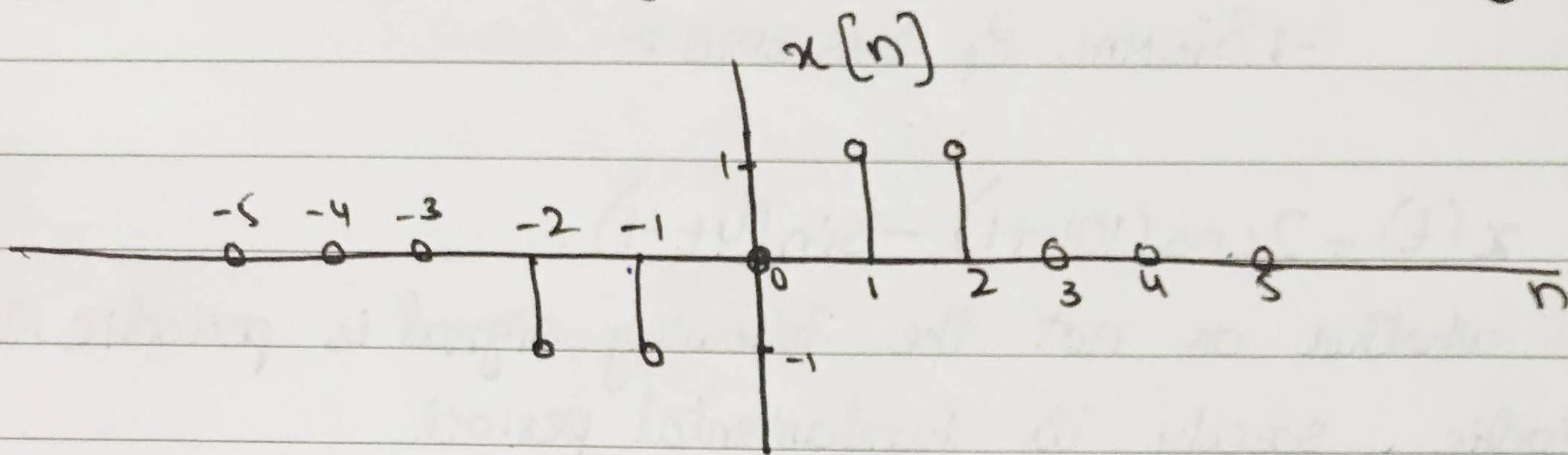
$$T_0 = \text{LCM}\left(\frac{\pi}{5}, \frac{\pi}{2}\right)$$

To take LCM of a fraction $\Rightarrow \frac{\text{LCM of Numerator}}{\text{HCF of Denominator}}$

$$T_0 = \text{LCM}\left(\frac{\pi}{5}, \frac{\pi}{2}\right) = \frac{\text{LCM of } \pi, \pi}{\text{HCF of } 5, 2}$$

$$T_0 = \frac{\pi}{1} \Rightarrow \pi \text{ is the fundamental period of } x(t)$$

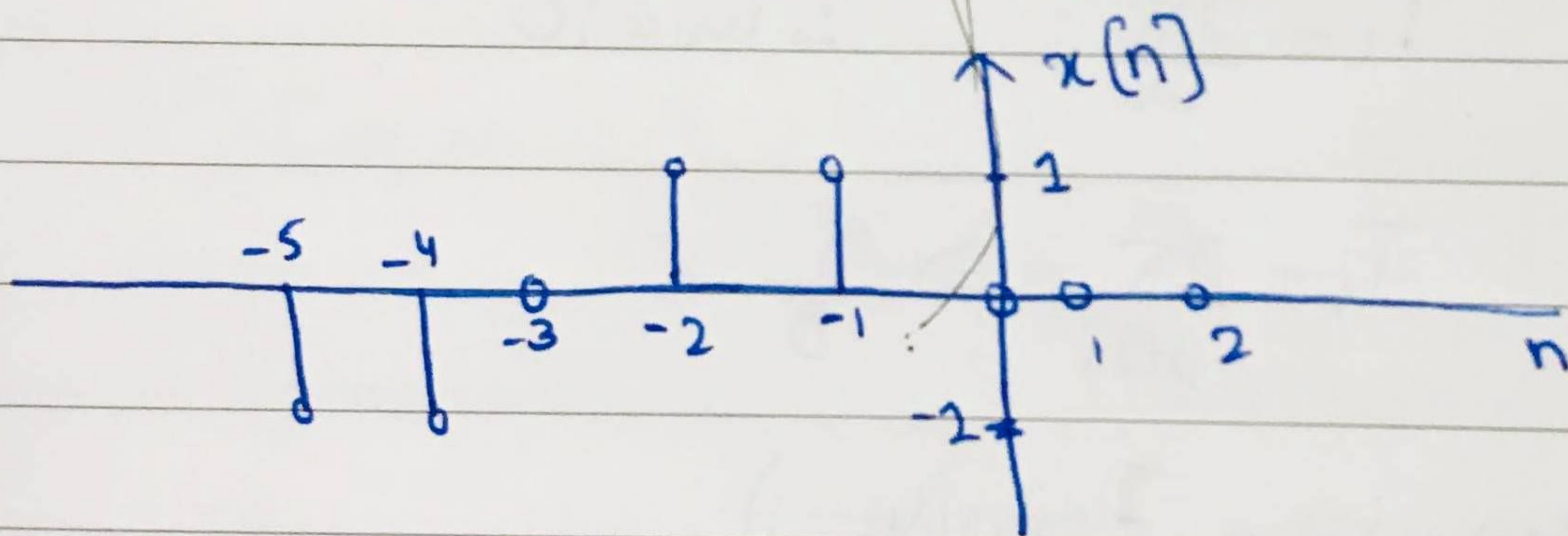
QUEST#2:- For the signal show below, sketch $y[n] = x[2n+3]$.



Soln

$$y[n] = x[2n+3]$$

First shift the signal by 3 points to the left.



Now scale with 2.

