Report

1. (a) $y[n] = \cos[n/16]$

$$N_0 = \frac{2\pi K}{\omega_0} = 12\pi K \quad \forall K \in Z$$

Since signal is discrete, N_0 cannot be in terms of π.

Inference from plot: Signal is Aperiodic

(b) $y[n] = \cos\left[\frac{8\pi}{31}\right]$

$$N_0 = \frac{2\pi K}{\omega_0} = \frac{31K}{4} \Rightarrow N_0 = 31 \quad (K=4)$$

Thus fundamental frequency is $\frac{1}{31}$

Inference : graph is periodic and repeats after 31 units

(c) $y(t) = \cos(t/6)$

$$T_0 = \frac{2\pi K}{\omega_0} = 12\pi \Rightarrow \text{fundamental frequency is } \frac{1}{12\pi}$$

Inference, graph is periodic

(d) $x(t) = \cos\left(\frac{t}{6}\right) + \sin\left(\frac{2\pi}{3}t\right)$

T_0 : LCM $\{12\pi, 3\}$ does not exist

Inference: graph is aperiodic and frequency does not exist.

2. $x(t) = 2e^{-\alpha t} \quad t \geq 0$

$= 0 \quad t < 0$

$Ev(x(t)) = \frac{x(t) + x(-t)}{2}$

$Ev(x(t)) = \begin{cases} e^{-\alpha t} & t \geq 0 \\ e^{\alpha t} & t < 0 \end{cases}$

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

$Odd(x(t)) = \begin{cases} e^{-\alpha t} & t \geq 0 \\ -e^{\alpha t} & t < 0 \end{cases}$

Value of α for plot $= 2$

Value of interval $= [-3, 3]$

The interval was chosen to be equi-distributed ~~along the~~ across the y axis to show the split signal at $t = 0$

The smaller values of interval and α helps visually to show the nature of curve and values for $x(t)$ at different t in the interval (since the signal is exponential it increases rapidly for higher values of t)