Even & odd signal:

3) $x(n) = \{2, -2, 6, -2\}$

$x(0) = 2$; $x(1) = -2$; $x(2) = 6$; $x(3) = -2$

$x(-n) = \{-2, 6, -2, 2\}$

$x(-3) = -2$; $x(-2) = 6$; $x(-1) = -2$;

$x(0) = 2$

Even part, $x_e(n) = \frac{1}{2}[x(n) + x(-n)]$

At $n = -3$; $x(n) + x(-n) = 0 + (-2) = -2$

At $n = -2$; $x(n) + x(-n) = 0 + 6 = 6$

At $n = -1$; $x(n) + x(-n) = 0 + (-2) = -2$

At $n = 0$; $x(n) + x(-n) = 2 + 2 = 4$

At $n = 1$; $x(n) + x(-n) = -2 + 0 = -2$

At $n = 2$; $x(n) + x(-n) = 6 + 0 = 6$

At $n = 3$; $x(n) + x(-n) = -2 + 0 = -2$

$x_e(n) = \frac{1}{2}\{-2, 6, -2, 4, -2, 6, -2\} = \{-1, 3, -1, 2, -1, 3, -1\}$

Odd part, $x_o(n) = \frac{1}{2}[x(n) - x(-n)]$

At $n=-3$; $x(n) - x(-n) = 0 - (-2) = 2$

At $n=-2$; $x(n) - x(-n) = 0 - 6 = -6$

At $n=-1$; $x(n) - x(-n) = 0 - (-2) = 2$

At $n=0$; $x(n) - x(-n) = 2 - 2 = 0$

At $n=1$; $x(n) - x(-n) = -2 - 0 = -2$

At $n=2$; $x(n) - x(-n) = 6 - 0 = 6$

At $n=3$; $x(n) - x(-n) = -2 - 0 = -2$

$$x_o(n) = \frac{1}{2}\{2, -6, 2, 0, -2, 6, -2\}$$

$$x_o(n) = \{1, -3, 1, \underset{\uparrow}{0}, -1, 3, -1\}$$

Periodic and Aperiodic Signal:

1) $x(n) = \sin 15\pi n$

The fundamental period is, $T = \frac{2\pi}{\omega}$

$\omega = 15\pi$

$T = \frac{2\pi}{15\pi}$

$\boxed{T = 0.133 \text{ Sec}} \Rightarrow$ periodic Signal.

2) $x(n) = \sin 20\pi n$

The fundamental period is, $T = \frac{2\pi}{\omega}$

$T = \frac{2\pi}{20\pi}$

$\boxed{T = 0.1 \text{ Sec}}$

$x(n)$ is a periodic Signal

3) $x(n) = \sin \sqrt{2}\pi n$

The fundamental period is $T = \frac{2\pi}{\omega}$

$T = \frac{2\pi}{\sqrt{2}\pi} = 1.414 \text{ S} \Rightarrow$ periodic signal.

4) $x(n) = \cos 4n + \sin \pi n$

$\omega_1 = 4$ $\qquad$ $\omega_2 = \pi$

$T_1 = \frac{2\pi}{\omega_1}$ $\qquad$ $T_2 = \frac{2\pi}{\omega_2}$

$T_1 = \frac{2\pi}{4}$ $\qquad$ $T_2 = \frac{2\pi}{\pi}$

$T_1 = \pi/2$ $\qquad$ $T_2 = 2$

$\frac{T_1}{T_2} = \frac{\pi/2}{2} = \pi/4 \Rightarrow$ Aperiodic signal.

5) $x(n) = \sin 5\pi n$

$T = 2\pi/\omega = 2\pi/5\pi$

$T = 0.4$ Sec

$x(n)$ is a periodic signal.