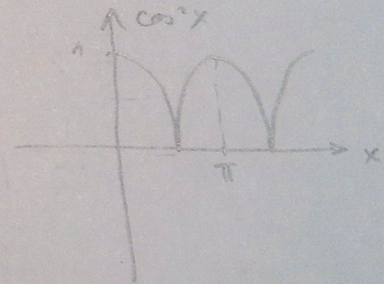
$\boxed{Z\,3.1-6a}$ 1) $f_1(n) = \cos^2\left(\frac{\pi n}{4}\right)$



$f_1(n) \overset{?}{=} f_1(n+N) \rightarrow N_0 = ?$

$$f_1(n+N) = \cos^2\left(\frac{\pi(n+N)}{4}\right) = \cos^2\left(\frac{\pi n + \pi N}{4}\right) = \cos^2\left(\frac{\pi n}{4} + \frac{\pi N}{4}\right)$$

$$\Rightarrow \frac{\pi N}{4} = k\pi \quad / \cdot \frac{4}{\pi}$$

$N = 4k \quad k \in \mathbb{Z} \Rightarrow N_0 = 4$

$$\Rightarrow \frac{\pi N}{4} = k\pi \quad / \cdot \frac{4}{\pi}$$

$$N = 4k \qquad k \in \mathbb{Z} \quad \Rightarrow \quad N_0 = 4$$

2) $f_2(n) = n \sin\left(\frac{\pi n}{4}\right)$

$$f_2(n+N) = (n+N)\sin\left(\frac{\pi n}{4} + \frac{\pi N}{4}\right) = (n+N)\left(\sin\frac{\pi n}{4}\cos\frac{\pi N}{4} + \cos\frac{\pi n}{4}\sin\frac{\pi N}{4}\right)$$

$$= n \sin\frac{\pi n}{4}\underbrace{\cos\frac{\pi N}{4}}_{\text{mora biti } =1} + n\cos\frac{\pi n}{4}\underbrace{\sin\frac{\pi N}{4}}_{\text{mora biti } =0} + N\sin\frac{\pi n}{4}\cos\frac{\pi N}{4} + N\cos\frac{\pi n}{4}\sin\frac{\pi N}{4} =$$

$\rightarrow$ mora biti $=0$ $\qquad$ $\rightarrow$ mora biti $=0$

$N = 0 \qquad \sin\frac{\pi N}{4} = 0 \qquad \cos\frac{\pi N}{4} = 1$

$\qquad N = 0 \qquad\qquad N = 0$

$\rightarrow$ nije periodična

$\left(\frac{\pi n^2}{\ldots}\right)$

$N = 0$ $\qquad\qquad$ $N = 0$

$\rightarrow$ nije periodična

3) $f_3(n) = \sin\left(\frac{\pi n^2}{4}\right)$

$$f_3(n+N) = \sin\left(\frac{\pi(n+N)^2}{4}\right) = \sin\left(\frac{\pi(n^2+2nN+N^2)}{4}\right) = \sin\left(\frac{\pi n^2}{4} + \frac{(2nN+N^2)\pi}{4}\right)$$

$$\frac{(2nN+N^2)\cancel{\pi}}{4} = 2k\cancel{\pi} \quad / \cdot \frac{1}{2}$$

$$\frac{nN}{4} + \frac{N^2}{8} = k \qquad k \in \mathbb{Z}$$

$$\frac{N}{4}\left(n + \frac{N}{2}\right) = k \rightarrow$$ Postoji li N t.d. za $\forall n \in \mathbb{Z}$ izraz bude cjelobrojan

$$\boxed{N_0 = 4} \Rightarrow 1(n+2) \in \mathbb{Z}$$

$\longrightarrow$

Z 3.1-8 c

1) $x_1(t) = \sin\left(\frac{\pi t}{3}\right) \Rightarrow$ periodični signal $\Rightarrow E = \infty$

$$P_{\tilde{x}_1} = \frac{1}{T}\int_T |x_1(t)|^2\, dt =$$

$\omega = \frac{\pi}{3}$ $\quad T = \frac{2\pi}{\omega} = \frac{2\pi}{\frac{\pi}{3}} = 6$

$$= \frac{1}{6}\int_0^6 \sin^2\left(\frac{\pi t}{3}\right) dt = \frac{1}{6}\int_0^6 \frac{1}{2}\left(1 - \cos\frac{2\pi t}{3}\right) dt =$$

$$= \frac{1}{12}\left[\int_0^6 dt - \int_0^6 \cos\frac{2\pi t}{3}\, dt\right] =$$

$$= \frac{1}{12}\left[t\Big|_0^6 - \frac{1}{\frac{2\pi}{3}}\sin\frac{2\pi t}{3}\Big|_0^6\right] =$$

$$= \frac{1}{12}\left(6 + \cancel{\frac{3}{2\pi}\left(\sin 4\pi - \sin 0\right)}^{\,0}\right) = \frac{1}{12}\cdot 6 = \boxed{\frac{1}{2}}$$

2) $x_2(t) = \cos\left(\frac{\pi t}{3}\right) \Rightarrow$ periodičan signal $\Rightarrow E = \infty$

$$P_{\tilde{x}_2} = \frac{1}{T}\int_T |x_2(t)|^2\, dt = \frac{1}{6}\int_0^6 \cos^2\left(\frac{\pi t}{3}\right) dt =$$

$\omega = \frac{\pi}{3} \Rightarrow T = \frac{2\pi}{\omega}$

$T = 6$

$$= \frac{1}{6}\int_0^6 \frac{1}{2}\left(1 + \cos\frac{2\pi t}{3}\right) dt =$$

$$= \frac{1}{12}\left[\int_0^6 dt + \cancel{\int_0^6 \cos\frac{2\pi t}{3}\, dt}^{\,0}\right] = \frac{1}{12}\cdot t\Big|_0^6 = \frac{6}{12} = \boxed{\frac{1}{2}}$$