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Assignment 2

1.3) a.) $x_1(t) = e^{-2t} u(t)$

$$E_\infty = \int_0^\infty e^{-2t} dt = \boxed{\frac{1}{4}}$$

$\underline{P_\infty = 0}$ since $E_\infty < \infty$

d.) $x_1[n] = \left(\frac{1}{2}\right)^n u[n] \Rightarrow |x_1[n]|^2 = \left(\frac{1}{4}\right)^n u[n]$

$$E_\infty = \sum_{n=-\infty}^{\infty} |x_1[n]|^2 = \sum_{n=0}^{\infty} \left(\frac{1}{4}\right)^n = \boxed{\frac{4}{3}}$$

$\boxed{P_\infty = 0}$ since $E_\infty < \infty$

1.6) b.) $x_2[n] = u[n] + u[-n]$

$\boxed{\text{No}}$, since $x_2(0) = 2$ is not seperated periodically

c.) $x_3[n] = \sum_{k=-\infty}^{\infty} \{\delta[n-4k] - \delta[n-1-4k]\}$

$\boxed{\text{Yes}}$, because $x_3[n]$ is a peridic signal ~~every~~ $n = 4$

~~1.7) d.) $x_3[n] = u[n] - u[n-4]$~~

~~$\Rightarrow x_{even}(n) = \frac{x(n) + x(-n)}{2}$~~

~~$= (u(n) - u(n-4) + u(-n) - u(-n-4)$~~

~~d.) $x_4(t) = ...$~~

1.7) d.) $x_4(t) = \cancel{\cancel{e}(\cancel{4u(t+2)})} e^{-5t} u(t+2)$

$x_{even}(t) = \frac{1}{2}\left[e^{-5t} u(t+2) + e^{-5(-t)} u(-t+2) \right]$

$e^{-5t} u(t+2) = 1$ for $\underline{t \geq -2}$

$e^{-5t} u(t+2) = 0$ for $\underline{t < -2}$

$e^{5t} u(-t+2) = 1$ for $\underline{t \leq 2}$

$e^{5t} u(-t+2) = 0$ for $\underline{t > 2}$

1.10) $x(t) = 2\cos(10t+1) - \sin(4t-1)$, $\quad T = \frac{2\pi}{\omega}$

T_1: $2\cos(10t+1) \Rightarrow T_1 = \frac{2\pi}{10} = \frac{\pi}{5} s$; $\omega = 10$

T_2: $-\sin(4t-1) \Rightarrow T_2 = \frac{2\pi}{4} = \frac{\pi}{2} s$, $\omega = 4$

ratio: $\dfrac{\frac{2\pi}{10}}{\frac{5\pi}{10}} = \frac{2}{5} s$; rational # = periodic

period: $\frac{\pi}{1} = \boxed{\pi}$

1.11) ~~X~~ ~~X~~

~~X~~ $x[n] = 1 + e^{j4\pi n/7} - e^{j2\pi n/5}$
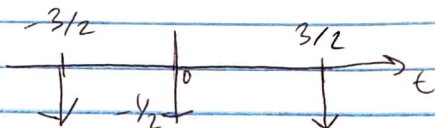
$T = \frac{2\pi}{\omega} \Rightarrow \omega = \frac{2\pi}{T}$, $\omega_1 = \frac{4\pi}{7}$ & $\omega_2 = \frac{2\pi}{5}$

$\Rightarrow T_1 = \cancel{\quad} \frac{7}{2}$ & $T_2 = 5$

ratio: $\dfrac{7/2}{5} = \cancel{\quad} \frac{7}{10}$; rational # = periodic

$T = \frac{7}{2} \cdot 10 = 7 \cdot 5 = \boxed{35}$

1.21) f.) $x(t) [\delta(t + 3/2) - \delta(t - 3/2)]$

1.25) a.) $x(t) e^{j(\pi t - 1)}$, $\omega = \pi$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{\pi} = \boxed{2 \text{ s}} \boxed{\text{Yes}}$$

d.) $x(t) = \mathcal{E}v\{\cos(4\pi t) u(t)\}$

$$\Rightarrow x(t) = 1/2 \cos(4\pi t) , \quad \omega = 4\pi$$

$$T = \frac{2\pi}{4\pi} = \boxed{\frac{1}{2} \text{ s}} \qquad \boxed{\text{Yes}}$$

1.26) b.) $x[h] = \cos(\frac{n}{8} - \pi)$ $\boxed{\text{No}}$