Quiz 1

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A. We may begin by finding the energy:

$$E_\infty = \lim_{T\to\infty} \int_{-T}^{T} |x(t)|^2 \, dt$$

Since the signal is finite, we have a nonzero value only for $0 \leq t \leq 1$. Therefore, we may write:

$$E_\infty = \int_0^1 |e^t|^2 \, dt$$

$$E_\infty = \int_0^1 e^{2t} \, dt$$

$$E_\infty = \frac{1}{2} e^{2t} 0^1$$

$$\boxed{E_\infty = \frac{1}{2}e^2 - \frac{1}{2}}$$

We then find the power:

$$P_\infty = \lim_{T\to\infty} \frac{E_\infty}{2T}$$

$$\boxed{P_\infty = 0}$$

Therefore, because energy is finite and power is 0, then <u>this is an energy signal</u>

B. (i) For $x(t+2)$:

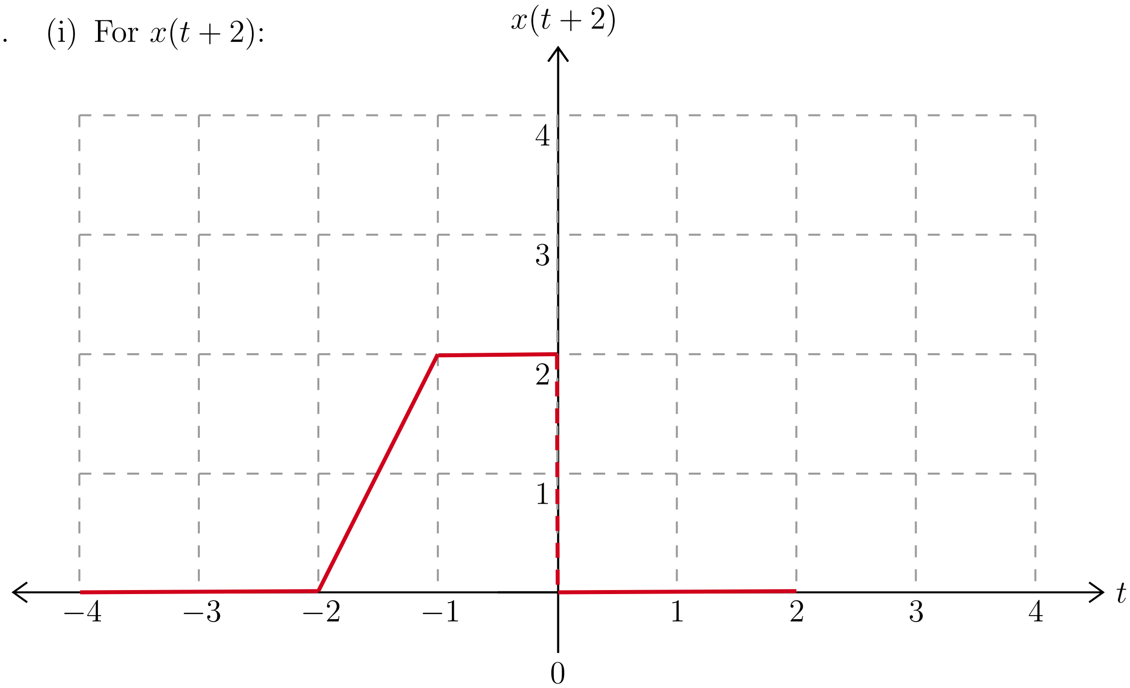

Figure 1: Plot for $x(t+2)$

(ii) For $x\left(-\frac{t}{2}+2\right)$:

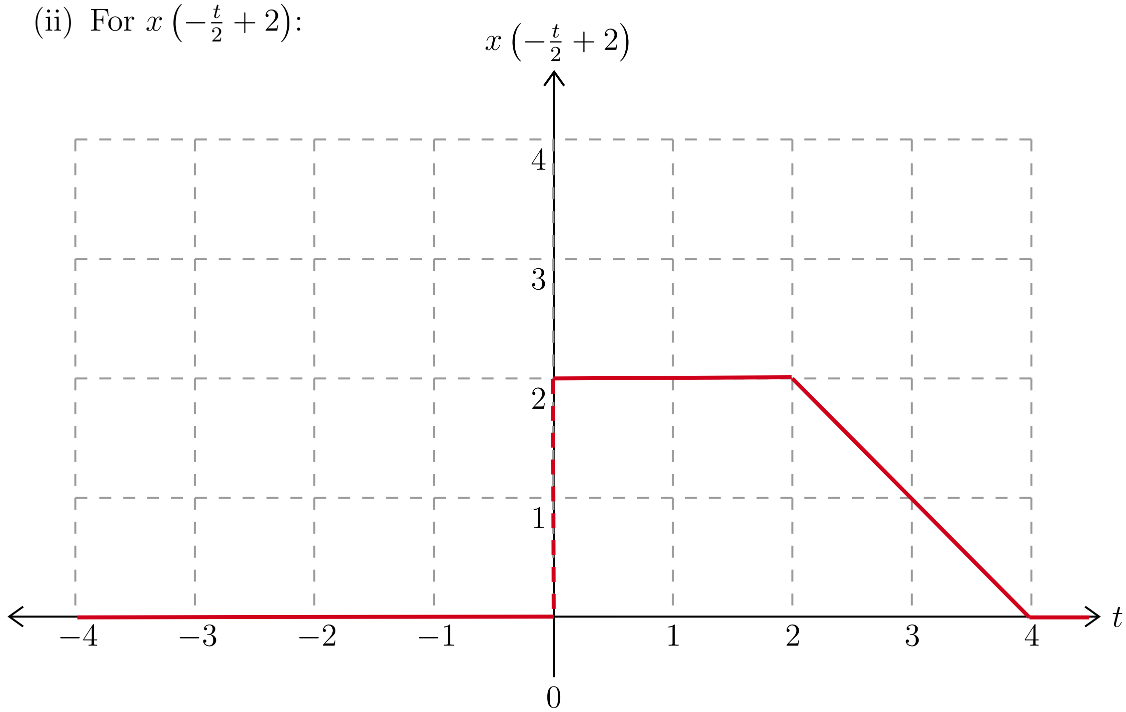

Figure 2: Plot for $x\left(-\frac{t}{2}+2\right)$

C. **I.** We begin by finding whether the individual sinusoids are periodic:

$$N_1 \to \frac{2\pi}{\frac{4\pi}{5}} \to \frac{5}{2}m \to 5$$

$$N_2 \to \frac{2\pi}{\frac{5\pi}{7}} \to \frac{14}{5}m \to 14$$

Thus, we see both are, individually, periodic.

We then find the least common factor between the two signals, which comes out to be:

$$N_o = aN_1 + bN_2 \to N_1N_2$$

$$\boxed{N_o = 70}$$

II. From the signal, we see that the leading term is $\left(\frac{1}{2}\right)^n$. Since this is a geometric, decaying series, the signal must converge. Therefore, <u>the signal is **not** periodic</u>