

TD No. 1

Exercise 1

Let the signal be $s(t)$ represented by the following mathematical model:

$$s(t) = A \sin\left(\omega_0 t + \frac{\pi}{12}\right); \text{ with : } A = 4 \quad \text{And} \quad \omega_0 = 50\pi \frac{\text{rad}}{\text{s}}.$$

1. What is the amplitude of this signal?
2. Calculate its period and frequency.
3. Calculate its offset from the origin, what is the nature of this offset (lag or advance).
4. Graph this signal.

Exercise 2

1. Give the expression of the signal $x(t) = A \operatorname{rect}\left(\frac{t - t_0 - \frac{T}{2}}{T}\right) = AP_T \left(t - t_0 - \frac{T}{2}\right)$ using unit step functions

and sign functions.

2. Justify graphically.

Exercise 3

Consider the following two signals:

$$x(t) = 8 \cdot \exp(-2|t|) \quad , \quad y(t) = 2 \cdot \exp(t)$$

Calculate their energies and powers.

Exercise 4

Consider the following two signals:

$$s_1(t) = a \quad \text{si } |t| \leq T \quad \text{et} \quad s_2(t) = 1 - \frac{|t|}{T} \quad \text{si } |t| \leq T$$

3. What is the common duration of the two signals?
4. Calculate their average powers.

Exercise 5

Consider the following signal:

$$s(t) = a \cdot \sin\left(\omega_0 t + \frac{\pi}{3}\right)$$

1. Is the signal periodic? If so, give its period.
2. Calculate its energy.
3. Calculate its average power.