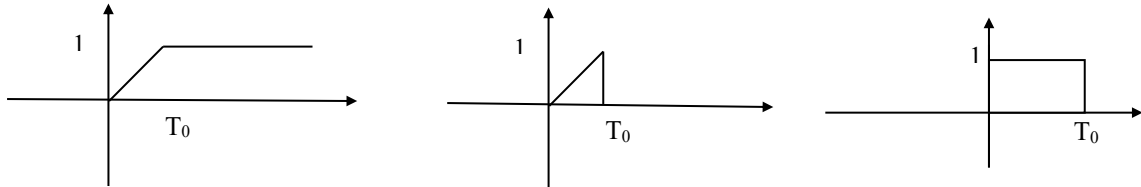


Homework

EXO1 : Among the signals below, identify which are periodic (give their periods) or aperiodic, and which are finite energy signals or finite average power signals. Calculate their energies and powers.

$$s_1(t) = 8\exp(-2|t|), \quad s_2(t) = 10\exp(-4t) \cdot \cos 10\pi t, \quad s_3(t) = \sin 2t + \sin 2\pi t \quad \text{et} \quad s_4(t) = 3|\cos 2\pi f_0 t|.$$

EXO2 : Provide a mathematical representation (using the signals: ramp and unit step) of each of the following signals :



EXO3 : Consider the following periodic signal:

$$s_1(t) = a \sum_{n=-\infty}^{+\infty} \delta(t - nT_0) \quad \text{where } \delta(t) \text{ is the Dirac impulse and } T_0 \text{ is its period.}$$

1. Graphically represent this signal.
2. Determine its complex Fourier series and its Fourier transform.
3. Deduce its trigonometric series.

EXO4

1. Give the Fourier transforms of the following signals:

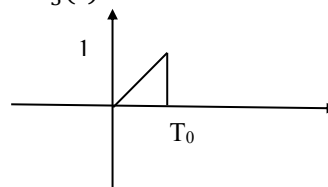
$$s_1(t) = \text{rect}_{T_0}(-t), \quad s_2(t) = u(-t), \quad s_3(t) = e^{j2\pi f_0 t_0}, \quad s_4(t) = e^{j2\pi f_0 t_0} \cdot \text{rect}_{T_0}(-t),$$

$$s_5(t) = 2\text{sinc}\left[2\pi\left(t - \frac{1}{2}\right)\right]$$

2. Plot the amplitude and phase spectrum of the signal $s_5(t)$.

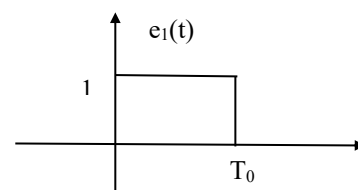
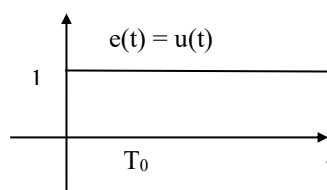
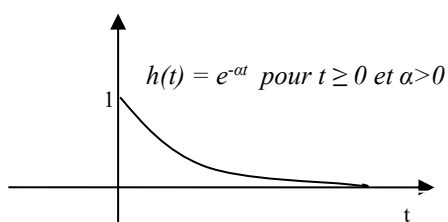
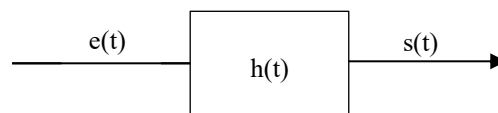
EXO5

Consider the signal in the opposite figure:



1. Provide a mathematical representation (using the signals: ramp and gate) of this signal.
2. Calculate its Fourier transform using the frequency differentiation method.

EXO6 : Use the graphical convolution method to find the output signal of the following system:



Deduce the output for the input signal $e_1(t)$.