

Tutorials No 02

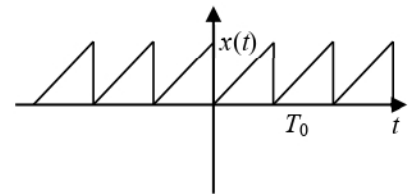
Exercise 1

Rewrite the three forms of the Fourier series which result the decomposition of a periodic signal of period T_0 and find the relationships between different coefficients.

Exercise 2

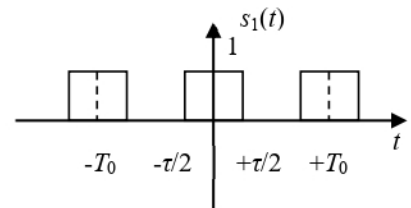
Let the signal $x(t)$ be:

1. Write the mathematical expression of $x(t)$ on the interval $[0, T_0]$.
2. Decompose the signal $x(t)$ into a Complex Fourier series.
3. Represent its amplitude and phase spectrum.
4. Deduce the Trigonometric Fourier series.



Exercise 3

1. Decompose the signal $s_1(t)$ into a Trigonometric Fourier series.
2. Deduce the Trigonometric Fourier series development of the signal $s_2(t)$ derive it from $s_1(t)$.



Exercise 4

Let $f(t)$ be the periodic function with period equal to 2π over $]0, \pi[$ and -1 over $]-\pi, 0]$.

1. Graph the periodic signal $f(t)$.
2. Calculate the Trigonometric Fourier coefficients.
3. Deduce the alternative Fourier series.

Exercise 5

1. Calculate the Fourier transform of the following signal:
$$s_1(t) = \sin^2\left(16\pi t + \frac{\pi}{4}\right)$$
2. Graphically represent the amplitude and phase spectrum.
3. Do the same work for the signal $s_2(t) = \sin(4\pi t) \cdot \cos^2(3\pi t)$ [**homework**]

Exercise 6

1. Calculate the energy contained in the signal:

$$s(t) = A \cdot T \cdot \text{sinc}(2\pi f_0 t)$$