Fourier series :

$$f(x)=\frac{a_0}{2}+\sum_{n=1}^{\infty}\left[a_n\cos\frac{n\pi x}{L}+b_n\sin\frac{n\pi x}{L}\right]$$

$$a_n=\frac{1}{L}\int_{-L}^{L}f(t)\cos\frac{n\pi t}{L}dt,\ n=0,1,2,3,\ldots$$

$$b_n=\frac{1}{L}\int_{-L}^{L}f(t)\sin\frac{n\pi t}{L}dt,\ n=1,2,3,\ldots$$

Fourier series is able to represent any piecewise regular function in the range [0,2L]

- Dirichlet conditions: f(x) has only a finite number of discontinuities and only a finite number of extreme values (maximum and minimum).
- Functions satisfying these conditions may be called piecewise regular.

Square wave

$$f(x)=\begin{cases}0, & -\pi<x<0,\\ h, & 0<x<\pi\end{cases}$$