

Fourier Cosine Series

Suppose that the function $f(t)$ is piecewise continuous on $[0, L]$. Then the *Fourier cosine series* of f is the series

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi t}{L},$$

where the coefficients are given by

$$a_n = \frac{2}{L} \int_0^L f(t) \cos \frac{n\pi t}{L} dt, \quad n = 0, 1, 2, 3, \dots$$

The cosine series is the regular Fourier series of the even extension of f to an even periodic function of period $2L$.

Fourier Sine Series

Suppose that the function $f(t)$ is piecewise continuous on $[0, L]$. Then the *Fourier sine series* of f is the series

$$\sum_{n=1}^{\infty} b_n \sin \frac{n\pi t}{L},$$

where the coefficients are given by

$$b_n = \frac{2}{L} \int_0^L f(t) \sin \frac{n\pi t}{L} dt, \quad n = 1, 2, 3, \dots$$

The sine series is the regular Fourier series of the odd extension of f to an odd periodic function of period $2L$.