



**Definition**

A *trigonometric polynomial* of order  $n$  is a function  $u : \mathbf{R} \rightarrow \mathbf{R}$  for which there exists  $\alpha_0, \alpha_1, \dots, \alpha_n, \beta_1, \beta_2, \dots, \beta_n \in \mathbf{R}$  so that

$$u(x) = \alpha_0 + \sum_{k=1}^n (\alpha_k \cos(kx) + \beta_k \sin(kx)).$$

In other words,

$$u(x) = \alpha_0 + \alpha_1 \cos x + \beta_1 \sin x + \alpha_2 \cos 2x + \beta_2 \sin 2x + \dots + \alpha_n \cos nx + \beta_n \sin nx.$$



