ABSTRAK

Suatu fungsi periodik f dengan periode 2p, dapat dinyatakan dalam bentuk deret Fourier sebagai berikut: $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty}\left[a_n \cos\frac{n\pi x}{p} + b_n \sin\frac{n\pi x}{p}\right]$

di mana $a_n = \frac{1}{p}\int_{-p}^{p} f(x)\cos\frac{n\pi x}{p}\,dx$ dan $b_n = \frac{1}{p}\int_{-p}^{p} f(x)\sin\frac{n\pi x}{p}\,dx$.

Fungsi yang tak periodik, yaitu untuk $p \to \infty$, dapat dinyatakan dalam bentuk integral Fourier: $f(x) = \int_{0}^{\infty}\left[A(s)\cos sx + B(s)\sin nx\right]ds$

di mana $A(s) = \frac{1}{\pi}\int_{0}^{\infty} f(t)\cos st\,dt$ dan $B(s) = \frac{1}{\pi}\int_{0}^{\infty} f(t)\sin st\,dt$.

Dalam bentuk kompleks $f(x) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty}\hat{f}(s)e^{isx}\,ds$,

di mana $\hat{f}(s) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} f(x)e^{-isx}\,dx$. Fungsi $\hat{f}(s)$ inilah yang disebut transform Fourier.

Dibahas penerapan transform Fourier pada persamaan diferensial parsial, khususnya persamaan panas dan persamaan gelombang yang melibatkan masalah nilai batas. Persamaan diferensilal parsial yang melibatkan transform Fourier berlaku seperti persamaan diferensial biasa.

ABSTRACT

A periodic function of period 2p, can be represented by a Fourier series:

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

where $a_n = \frac{1}{p}\int_{-p}^{p} f(x)\cos\frac{n\pi x}{p}dx$ and $b_n = \frac{1}{p}\int_{-p}^{p} f(x)\sin\frac{n\pi x}{p}dx$.

A non periodic function, i.e for $p \to \infty$, can be expressed as a Fourier integral

$$f(x) = \int_0^{\infty}\left[A(s)\cos sx + B(s)\sin nx\right]ds$$

where $A(s) = \frac{1}{\pi}\int_0^{\infty} f(t)\cos st\,dt$ and $B(s) = \frac{1}{\pi}\int_0^{\infty} f(t)\sin st\,dt$.

In the complex form $f(x) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty}\hat{f}(s)e^{isx}\,ds$, where $\hat{f}(s) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} f(x)e^{-isx}\,dx$.

This function $\hat{f}(s)$ is called Fourier transform.

We discuss the application of Fourier transform in the partial differential equations, in particular in the heat equation and the wave equation which involve the boundary value problems. The partial differential equations involving Fourier transform behave like ordinary differential equations.