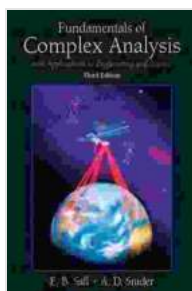


With Applications To Engineering And Science: A Comprehensive Guide to the Mathematics of Fourier Transforms

Fourier transforms are a powerful mathematical tool that have applications in a wide variety of fields, including engineering, science, and medicine. They are used to analyze and solve problems involving periodic functions, such as those that arise in the study of sound, light, and heat.

This book provides a comprehensive and accessible to the mathematics of Fourier transforms, with a focus on applications to engineering and science. The book is written in a clear and engaging style, and includes numerous examples and exercises to help the reader understand the material.



Fundamentals of Complex Analysis: with Applications to Engineering and Science (2-downloads) (Pearson Modern Classics for Advanced Mathematics Series)

by Frank Morgan

★★★★☆ 4.4 out of 5

Language : English

File size : 8804 KB

Print length : 576 pages

Screen Reader : Supported



Chapter 1: The Fourier Transform

The first chapter of the book introduces the Fourier transform. The Fourier transform is a mathematical operation that converts a function of time or space into a function of frequency. This allows us to analyze the frequency content of a signal, and to identify the frequencies that are present in the signal.

The Fourier transform is defined by the following equation:

$$F(\omega) = \int_{-\infty, \infty} f(t)e^{-i\omega t} dt$$

where

* $F(\omega)$ is the Fourier transform of $f(t)$ * ω is the frequency * i is the imaginary unit

The inverse Fourier transform is defined by the following equation:

$$f(t) = 1/(2\pi) \int_{-\infty, \infty} F(\omega)e^{i\omega t} d\omega$$

Chapter 2: Properties of the Fourier Transform

The second chapter of the book discusses the properties of the Fourier transform. The Fourier transform is a linear operator, which means that it satisfies the following properties:

$$* F(af(t) + bg(t)) = aF(f(t)) + bF(g(t)) * F(f(t - a)) = e^{-i\omega a}F(f(t))$$

The Fourier transform is also a convolution operator, which means that it satisfies the following property:

$$* F(f(t) * g(t)) = F(f(t))F(g(t))$$

Chapter 3: Applications of the Fourier Transform

The third chapter of the book discusses applications of the Fourier transform to engineering and science. The Fourier transform is used in a wide variety of applications, including:

* Signal processing * Image processing * Heat transfer * Fluid dynamics * Acoustics * Optics

Chapter 4: The Discrete Fourier Transform

The fourth chapter of the book introduces the discrete Fourier transform (DFT). The DFT is a discrete-time version of the Fourier transform that is used to analyze digital signals. The DFT is defined by the following equation:

$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-i2\pi kn/N}$$

where

* $X(k)$ is the DFT of $x(n)$ * k is the frequency index * N is the length of the signal

The inverse DFT is defined by the following equation:

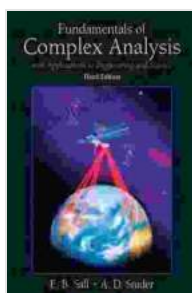
$$x(n) = 1/N \sum_{k=0}^{N-1} X(k)e^{i2\pi kn/N}$$

Chapter 5: Applications of the Discrete Fourier Transform

The fifth chapter of the book discusses applications of the DFT to engineering and science. The DFT is used in a wide variety of applications, including:

* Speech processing * Music synthesis * Image compression * Radar *
Sonar

This book provides a comprehensive and accessible to the mathematics of Fourier transforms, with a focus on applications to engineering and science. The book is written in a clear and engaging style, and includes numerous examples and exercises to help the reader understand the material.



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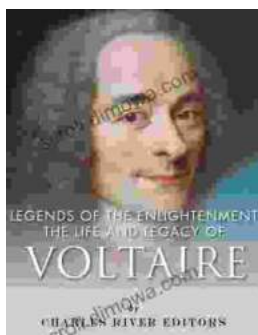
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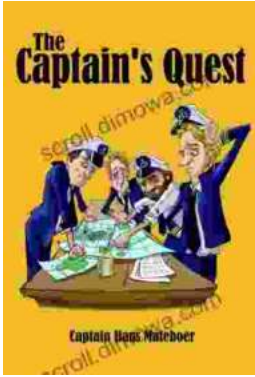
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