Functional Integration and Partial Differential Equations, AM-109, Volume 109

Functional integration is a powerful mathematical tool that has found applications in a wide range of fields, including mathematical physics, statistical mechanics, fluid dynamics, image processing, and data analysis. It is closely related to partial differential equations (PDEs),which are used to describe a variety of physical phenomena.

Functional Integration and Partial Differential Equations. (AM-109),Volume 109 (Annals of Mathematics Studies) by Vincent de Longueville

★★★★★ 5 out of 5

Language	: English
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This book provides a comprehensive overview of the interplay between functional integration and PDEs. It begins with an to the basic concepts of functional integration, including the Wiener measure and the path integral. It then explores the use of functional integration to solve PDEs, with a focus on diffusion processes and stochastic analysis. The book also discusses applications of functional integration in quantum field theory, statistical mechanics, and other areas of physics.

Table of Contents

- Chapter 1:
- Chapter 2: Functional Integration
- Chapter 3: Partial Differential Equations
- Chapter 4: Diffusion Processes and Stochastic Analysis
- Chapter 5: Applications in Quantum Field Theory
- Chapter 6: Applications in Statistical Mechanics
- Chapter 7: Applications in Other Areas of Physics
- Appendix
- References
- Index

Chapter 1:

This chapter provides an overview of the book and its goals. It discusses the history of functional integration and its relationship to PDEs. It also introduces the basic concepts of functional integration, including the Wiener measure and the path integral.

Chapter 2: Functional Integration

This chapter provides a detailed exposition of the theory of functional integration. It begins with a discussion of the Wiener measure, which is a probability measure on the space of continuous paths. It then introduces the path integral, which is a way to represent the expectation value of a functional of a path. The chapter also discusses the use of functional integration to solve PDEs, with a focus on diffusion processes and stochastic analysis.

Chapter 3: Partial Differential Equations

This chapter provides an overview of the theory of PDEs. It begins with a discussion of the basic concepts of PDEs, including the classification of PDEs and the method of characteristics. It then discusses the use of PDEs to describe a variety of physical phenomena, including diffusion, wave propagation, and fluid flow. The chapter also discusses the use of functional integration to solve PDEs.

Chapter 4: Diffusion Processes and Stochastic Analysis

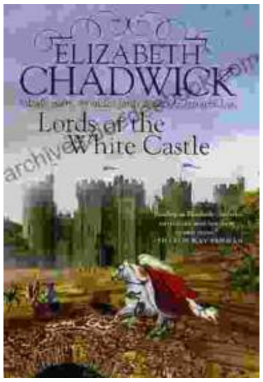
This chapter discusses the use of functional integration to study diffusion processes and stochastic analysis. It begins with a discussion of the Langevin equation, which is a stochastic differential equation that describes the motion of a particle in a fluid. It then discusses the use of functional integration to solve the Langevin equation and other stochastic differential equations. The chapter also discusses the use of functional integration to study other topics in stochastic analysis, such as the Wiener process and the Ornstein-Uhlenbeck process.

Chapter 5: Applications in Quantum Field Theory

This chapter discusses the use of functional integration in quantum field theory. It begins with a discussion of the path integral formulation of quantum mechanics, which is based on the idea that a particle can be represented as a path in spacetime. It then discusses the use of functional integration to calculate the Feynman diagrams that represent the interactions of particles in quantum field theory. The chapter also discusses the use of functional integration to study other topics in quantum field theory, such as the renormalization group and the electroweak theory.

Chapter 6: Applications in Statistical Mechanics

This chapter discusses the use of functional integration in statistical mechanics. It begins with a discussion of the partition function, which is a function that can be used to calculate the thermodynamic properties of a system. It then discusses the use of functional integration to calculate the partition function for a variety of systems, including ideal gases, liquids, and solids. The chapter also discusses the use of functional integration to study other topics in statistical mechanics, such as the theory of phase transitions and the



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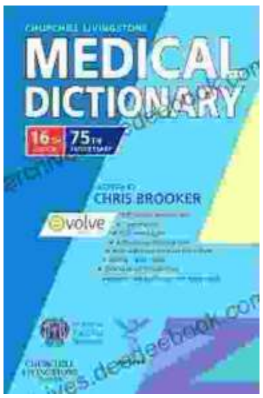

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