

Mathematical Methods of Modern Physics

Prof. Dr. Bernd Rosenow, SS 2024

For: Bachelor: Physics (6. semester) & IPSP (6. semester),
Master: Physics & IPSP & Mathematical Physics

Workload: 5 LP, 1 lecture (English) + 1 tutorial (English) per week

Exam: 1 exam (90 min), prerequisite is 50% of the points from the weekly exercise sheets

Contents:

- Complex analysis:

- Holomorphic functions

$$f'(z_0) = \left. \frac{df(z)}{dz} \right|_{z_0}$$

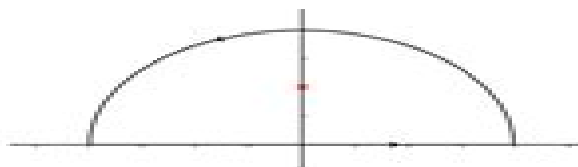
- Residue theorem

$$\oint_{\gamma} f(z) dz = 2\pi i \sum_k \Gamma(\gamma, a_k) \operatorname{Res}(f, a_k)$$

- Laurent series

$$f(z) = \sum_{n=-\infty}^{\infty} b_n z^n$$

- Applications to real integrals



$$\int_{-\infty}^{\infty} \frac{1}{x^2 + 1} dx = 2\pi i \frac{1}{2i} = \pi$$

- Distributions and Fourier transformation

$$G^<(k, E) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \frac{1}{2\pi} \frac{e^{-ixk} e^{iEt}}{x - vt - i\delta} dx dt = 2\pi i \delta(E - vk) \Theta(-vk)$$

- Eigenvalues and eigenfunctions

Methods Of Modern Mathematical Physics

Michael Reed, Barry Simon



Methods Of Modern Mathematical Physics:

Methods of Modern Mathematical Physics: Functional analysis Michael Reed, Barry Simon, 1980 This book is the first of a multivolume series devoted to an exposition of functional analysis methods in modern mathematical physics It describes the fundamental principles of functional analysis and is essentially self contained although there are occasional references to later volumes We have included a few applications when we thought that they would provide motivation for the reader Later volumes describe various advanced topics in functional analysis and give numerous applications in classical physics modern physics and partial differential equations Publisher description **II: Fourier Analysis, Self-Adjointness**

Michael Reed, Barry Simon, 1975 Band 2

Methods of Modern Mathematical Physics Michael Reed, 2012-12-02

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Mathematical Physics Michael Reed, Barry Simon, 1972

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Modern Mathematical Physics, Vol. 1: Functional Analysis M. Reed, 1980

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Physics Michael Reed, Barry Simon, 1972

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I: Functional

Analysis Michael Reed, Barry Simon, 1981-02-23 This book is the first of a multivolume series devoted to an exposition of functional analysis methods in modern mathematical physics It describes the fundamental principles of functional analysis and is essentially self contained although there are occasional references to later volumes We have included a few applications when we thought that they would provide motivation for the reader Later volumes describe various advanced topics in functional analysis and give numerous applications in classical physics modern physics and partial differential equations **Methods of Modern Mathematical Physics** Michael Reed (joint author), 1972 **Methods of Modern**

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Table of Contents Methods Of Modern Mathematical Physics

1. Understanding the eBook Methods Of Modern Mathematical Physics
 - The Rise of Digital Reading Methods Of Modern Mathematical Physics
 - Advantages of eBooks Over Traditional Books
2. Identifying Methods Of Modern Mathematical Physics
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Methods Of Modern Mathematical Physics
 - User-Friendly Interface
4. Exploring eBook Recommendations from Methods Of Modern Mathematical Physics
 - Personalized Recommendations
 - Methods Of Modern Mathematical Physics User Reviews and Ratings
 - Methods Of Modern Mathematical Physics and Bestseller Lists

5. Accessing Methods Of Modern Mathematical Physics Free and Paid eBooks
 - Methods Of Modern Mathematical Physics Public Domain eBooks
 - Methods Of Modern Mathematical Physics eBook Subscription Services
 - Methods Of Modern Mathematical Physics Budget-Friendly Options
6. Navigating Methods Of Modern Mathematical Physics eBook Formats
 - ePub, PDF, MOBI, and More
 - Methods Of Modern Mathematical Physics Compatibility with Devices
 - Methods Of Modern Mathematical Physics Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Methods Of Modern Mathematical Physics
 - Highlighting and Note-Taking Methods Of Modern Mathematical Physics
 - Interactive Elements Methods Of Modern Mathematical Physics
8. Staying Engaged with Methods Of Modern Mathematical Physics
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Methods Of Modern Mathematical Physics
9. Balancing eBooks and Physical Books Methods Of Modern Mathematical Physics
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Methods Of Modern Mathematical Physics
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Methods Of Modern Mathematical Physics
 - Setting Reading Goals Methods Of Modern Mathematical Physics
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Methods Of Modern Mathematical Physics
 - Fact-Checking eBook Content of Methods Of Modern Mathematical Physics
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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