

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

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

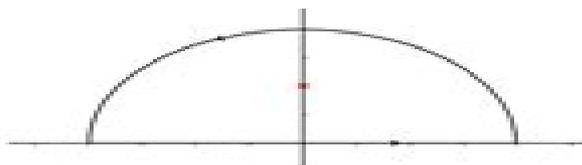
- Residue theorem

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

- 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

Introduction To Mathematical Physics Methods Concepts

E Durkheim



Introduction To Mathematical Physics Methods Concepts:

Introduction to Mathematical Physics Chun Wa Wong, 2013-01-24 Mathematical physics provides physical theories with their logical basis and the tools for drawing conclusions from hypotheses Introduction to Mathematical Physics explains to the reader why and how mathematics is needed in the description of physical events in space For undergraduates in physics it is a classroom tested textbook on vector analysis linear operators Fourier series and integrals differential equations special functions and functions of a complex variable Strongly correlated with core undergraduate courses on classical and quantum mechanics and electromagnetism it helps the student master these necessary mathematical skills It contains advanced topics of interest to graduate students on relativistic square root spaces and nonlinear systems It contains many tables of mathematical formulas and references to useful materials on the Internet It includes short tutorials on basic mathematical topics to help readers refresh their mathematical knowledge An appendix on Mathematica encourages the reader to use computer aided algebra to solve problems in mathematical physics A free Instructor s Solutions Manual is available to instructors who order the book for course adoption

Introduction to Mathematical Physics Chun Wa Wong, 1991 Designed as a reference as well as a junior or senior level textbook this book is designed to help physics undergraduates acquire an appreciation of the mathematical basis of physical theories and achieve the expected level of competence in mathematical manipulations It comprises topics prerequisite to the study of the standard undergraduate courses in physics and topics for advanced students including vector calculus matrices and Fourier series and transforms

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Introduction to Mathematical Physics, 2009 1 Some mathematical problems and their solution 2 N body problem and matter description 3 Relativity 4 Electromagnetism 5 Quantum mechanics 6 N body problem in quantum 7 Statistical physics 8 N body problems and statistical equilibrium 9 Continuous approximation 10 Energy in continuous media 11 Appendix *Mathematical Methods* Sadri Hassani, 2008-10-08 Intended to follow the usual introductory physics courses this book has the unique feature of addressing the mathematical needs of sophomores and juniors in physics engineering and other related fields Many original lucid and relevant examples from the physical sciences problems at the ends of chapters and boxes to emphasize important concepts help guide the student through the material Beginning with reviews of vector algebra and differential and integral calculus the book continues with infinite series vector analysis complex algebra and analysis ordinary and partial differential equations Discussions of numerical analysis nonlinear dynamics and chaos and the Dirac delta function provide an introduction to modern topics in mathematical physics This new edition has been made more user friendly through

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Mathematical Physics Donald Howard Menzel,1961 *College of Literature, Science, and the Arts* University of Michigan. College of Literature, Science, and the Arts,1923 **An Elementary Treatise on Fourier's Series, and Spherical, Cylindrical, and Ellipsoidal Harmonics, with Applications to Problems in Mathematical Physics** William Elwood Byerly,1893 **New Scientist** ,1991 **The Encyclopaedia and Dictionary of Education** Foster Watson,1922

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