1. Record Nr. UNISALENTO991003377429707536

Autore	Hall, Brian C., author
Titolo	Quantum theory for mathematicians / Brian C. Hall
ISBN	9781489993625
Descrizione fisica	xvi, 554 p. : ill. ; 24 cm
Collana	Graduate texts in mathematics ; 267 Graduate texts in mathematics, 0072-5285 ; 267
Classificazione	AMS 81-02 AMS 46N50 LC QC174.12.H346
Disciplina	530.15
Soggetti	Quantum theory - Mathematics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references (pages 545-548) and index
Nota di contenuto	The experimental origins of quantum mechanics: Is light a wave or a particle? ; Is an electron a wave or a particle? ; SchroÌdinger and Heisenberg ; A matter of interpretation ; Exercises -- A first approach to classical mechanics: Motion in RÂ¹ ; Motion in R[superscript n] ; Systems of particles ; Angular momentum ; Poisson brackets and Hamiltonian mechanics ; The Kepler problem and the Runge-Lenz vector ; Exercises -- First approach to quantum mechanics: Waves, particles, and probabilities ; A few words about operators and their adjoints ; Position and the position operator ; Momentum and the momentum operator ; The position and momentum operators ; Axioms of quantum mechanics : operators and measurements ; Time-evolution in quantum theory ; The Heisenberg picture ; Example : a particle in a box ; Quantum mechanics for a particle in R [superscript n] ; Systems of multiple particles ; Physics notation ; Exercises -- The free SchroÌdinger equation: Solution by means of the Fourier transform ; Solution as a convolution ; Propagation of the wave packet : first approach ; Propagation of the wave packet : second approach ; Spread of the wave packet ; Exercises -- Particle in a square well: The time-independent SchroÌdinger equation ; Domain questions and the matching conditions ; Finding square-integrable solutions ; Tunneling and the classically forbidden region ; Discrete and continuous spectrum ; Exercises --

Perspectives on the spectral theorem: The difficulties with the infinite-dimensional case ; The goals of spectral theory ; A guide to reading ; The position operator ; Multiplication operators ; The momentum operator -- The spectral theorem for bounded self-adjoint operators : statements: Elementary properties of bounded operators ; Spectral theorem for bounded self-adjoint operators, I ; Spectral theorem for bounded self-adjoint operators, II ; Exercises -- The spectral theorem for bounded self-adjoint operators : proofs: Proof of the spectral theorem, first version ; Proof of the spectral theorem, second version ; Exercises -- Unbounded self-adjoint operators: Introduction ; Adjoint and closure of an unbounded operator ; Elementary properties of adjoints and closed operators ; The spectrum of an unbounded operator ; Conditions for self-adjointness and essential self-adjointness ; A counterexample ; An example ; The basic operators of quantum mechanics ; Sums of self-adjoint operators ; Another counterexample ; Exercises -- The spectral theorem for unbounded self-adjoint operators: Statements of the spectral theorem ; Stone's theorem and one-parameter unitary groups ; The spectral theorem for bounded normal operators ; Proof of the spectral theorem for unbounded self-adjoint operators ; Exercises -- The harmonic oscillator: The role of the harmonic oscillator ; The algebraic approach ; The analytic approach ; Domain conditions and completeness ; Exercises -- The uncertainty principle: Uncertainty principle, first version ; A counterexample ; Uncertainty principle, second version ; Minimum uncertainty states ; Exercises -- Quantization schemes for Euclidean space: Ordering ambiguities ; Some common quantization schemes ; The Weyl quantization for RÂ²[superscript n] ; The "No go" theorem of Groenewold ; Exercises -- The Stone-Von Neumann theorem: A heuristic argument ; The exponentiated commutation relations ; The theorem ; The Segal-Bargmann space ; Exercises -- The WKB approximation: Introduction ; The old quantum theory and the Bohr-Sommerfeld condition ; Classical and semiclassical approximations ; The WKB approximation away from the turning points ; The Airy function and the connection formulas ; A rigorous error estimate ; Other approaches ; Exercises -- Lie groups, Lie algebras, and representations: Summary ; Matrix Lie groups ; Lie algebras ; The matrix exponential ; The Lie algebra of a matrix Lie group ; Relationships between Lie groups and Lie algebras ; Finite-dimensional representations of Lie groups and Lie algebras ; New representations from old ; Infinite-dimensional unitary representations ; Exercises -- Angular momentum and spin: The role of angular momentum in quantum mechanics ; The angular momentum operators in RÂ³ ; Angular momentum from the Lie algebra point of view ; The irreducible representations of so(3) ; The irreducible representations of SO(3) ; Realizing the representations inside LÂ²(SÂ²) -- Realizing the representations inside LÂ²(MÂ³) ; Spin ; Tensor products of representations : "addition of angular momentum" ; Vectors and vector operators ; Exercises -- Radial potentials and the hydrogen atom: Radial potentials ; The hydrogen atom : preliminaries ; The bound states of the hydrogen atom ; The Runge-Lenz vector in the quantum Kepler problem ; The role of spin ; Runge-Lenz calculations ; Exercises -- Systems and subsystems, multiple particles: Introduction ; Trace-class and Hilbert-Schmidt operators ; Density matrices : the general notion of the state of a quantum system ; Modified axioms for quantum mechanics ; Composite systems and the tensor product ; Multiple particles : bosons and fermions ; "Statistics" and the Pauli exclusion principle ; Exercises -- The path integral formulation of quantum mechanics: Trotter product formula ; Formal derivation of the Feynman

path integral ; The imaginary-time calculation ; The Wiener measure ; The Feynman-Kac formula ; Path integrals in quantum field theory ; Exercises -- Hamiltonian mechanics on manifolds: Calculus on manifolds ; Mechanics on symplectic manifolds ; Exercises -- Geometric quantization on Euclidean space: Introduction ; Prequantization ; Problems with prequantization ; Quantization ; Quantization of observables ; Exercises -- Geometric quantization on manifolds: Introduction ; Line bundles and connections ; Prequantization ; Polarizations ; Quantization without half-forms ; Quantization with half-forms : the real case ; Quantization with half-forms : the complex case ; Pairing maps ; Exercises -- A review of basic material: Tensor products of vector spaces ; Measure theory ; Elementary functional analysis ; Hilbert spaces and operators on them