

Physics 491: Quantum Mechanics 1  
 Problem Set #3: Solutions

Problem 1 Square packet

Initial plane wave  $\psi_0 e^{i p_0 x / \hbar}$  is localized in a region of width  $a$

$$\psi(x) = \begin{cases} A e^{i p_0 x / \hbar} & -\frac{a}{2} \leq x \leq \frac{a}{2} \\ 0 & \text{otherwise} \end{cases}$$

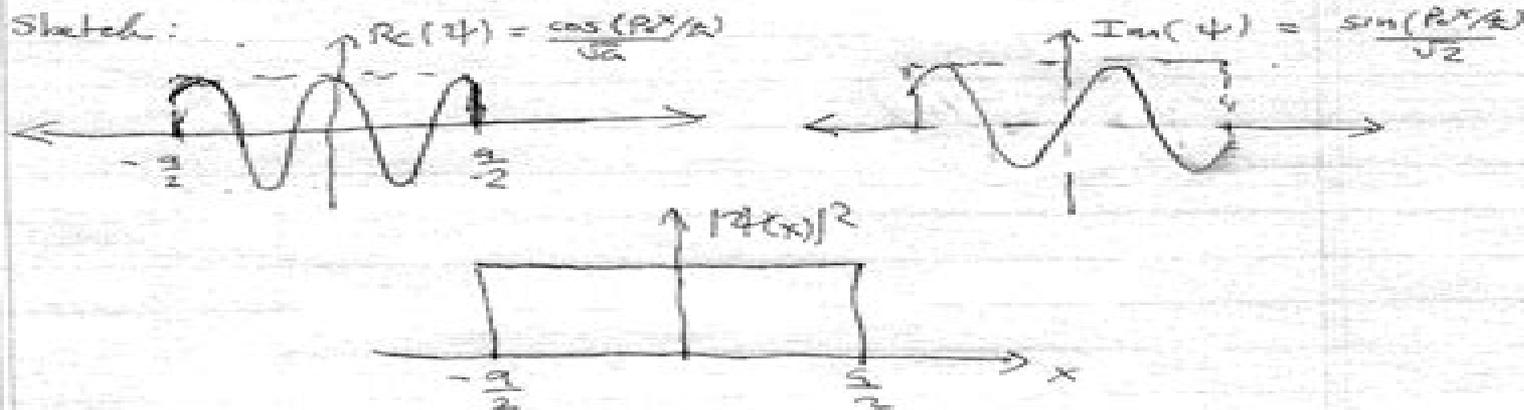
(a) Normalization  $\int_{-\infty}^{\infty} |\psi(x)|^2 dx = \int_{-a/2}^{a/2} dx |A|^2 = 1$

$\Rightarrow a |A|^2 = 1$

$\Rightarrow A = \frac{e^{i\phi}}{\sqrt{a}}$  ← overall phase is arbitrary (set  $\phi = 0$ )

$\Rightarrow \psi(x) = \frac{1}{\sqrt{a}} e^{i p_0 x / \hbar}, -\frac{a}{2} \leq x \leq \frac{a}{2}$

Sketch:



Note that the probability density in "position space" does not depend on the momentum  $p_0$

# Quantum Mechanics Exam Solutions

**Ian Pickup**



## Quantum Mechanics Exam Solutions:

**Conquering the Physics GRE** Yoni Kahn, Adam Anderson, 2018-03 A self contained guide to the Physics GRE reviewing all of the topics covered alongside three practice exams with fully worked solutions

**Engineering Physics Exam Review** Cybellium, 2024-10-26 Designed for professionals students and enthusiasts alike our comprehensive books empower you to stay ahead in a rapidly evolving digital world Expert Insights Our books provide deep actionable insights that bridge the gap between theory and practical application Up to Date Content Stay current with the latest advancements trends and best practices in IT AI Cybersecurity Business Economics and Science Each guide is regularly updated to reflect the newest developments and challenges Comprehensive Coverage Whether you re a beginner or an advanced learner Cybellium books cover a wide range of topics from foundational principles to specialized knowledge tailored to your level of expertise Become part of a global network of learners and professionals who trust Cybellium to guide their educational journey [www.cybellium.com](http://www.cybellium.com)

**Maple in Mathematics Education and Research** Jürgen Gerhard, Ilias Kotsireas, 2020-02-27 This book constitutes the refereed proceedings of the third Maple Conference MC 2019 held in Waterloo Ontario Canada in October 2019 The 21 revised full papers and 9 short papers were carefully reviewed and selected out of 37 submissions one invited paper is also presented in the volume The papers included in this book cover topics in education algorithms and applications of the mathematical software Maple

**Annual Catalog - United States Air Force Academy** United States Air Force Academy, 1979

**Optics and Spectroscopy**, 2001

**Problems And Solutions On Quantum Mechanics (Second Edition)** Swee Cheng Lim, Choy Heng Lai, Leong-chuan Kwek, 2022-06-02 This volume is a comprehensive compilation of carefully selected questions at the PhD qualifying exam level including many actual questions from Columbia University University of Chicago MIT State University of New York at Buffalo Princeton University University of Wisconsin and the University of California at Berkeley over a twenty year period Topics covered in this book include the basic principles of quantum phenomena particles in potentials motion in electromagnetic fields perturbation theory and scattering theory among many others This latest edition has been updated with more problems and solutions and the original problems have also been modernized excluding outdated questions and emphasizing those that rely on calculations The problems range from fundamental to advanced in a wide range of topics on quantum mechanics easily enhancing the student s knowledge through workable exercises Simple to solve problems play a useful role as a first check of the student s level of knowledge whereas difficult problems will challenge the student s capacity on finding the solutions

**Problems in Classical and Quantum Mechanics** J. Daniel Kelley, Jacob J. Leventhal, 2016-11-30 This book is a collection of problems that are intended to aid students in graduate and undergraduate courses in Classical and Quantum Physics It is also intended to be a study aid for students that are preparing for the PhD qualifying exam Many of the included problems are of a type that could be on a qualifying exam Others are meant to elucidate important concepts Unlike other compilations of problems the detailed

solutions are often accompanied by discussions that reach beyond the specific problem The solution of the problem is only the beginning of the learning process it is by manipulation of the solution and changing of the parameters that a great deal of insight can be gleaned The authors refer to this technique as massaging the problem and it is an approach that the authors feel increases the pedagogical value of any problem **American Journal of Physics** ,2002 *McGraw-Hill Concise Encyclopedia of Science and Technology, Sixth Edition* McGraw-Hill Education,2009-06-10 Publisher s Note Products purchased from Third Party sellers are not guaranteed by the publisher for quality authenticity or access to any online entitlements included with the product A major revision of this classic encyclopedia covering all areas of science and technology the McGraw Hill Concise Encyclopedia of Science and Technology Sixth Edition is prepared for students professionals and general readers seeking concise yet authoritative overviews of topics in all major fields in science and technology The McGraw Hill Concise Encyclopedia of Science and Technology Sixth Edition satisfies the needs of readers for an authoritative comprehensive reference work in a relatively compact format that provides the breadth of coverage of the McGraw Hill Encyclopedia of Science Technology 10th Edition Written in clear nonspecialist language understandable to students and general readers yet with sufficient depth for scientists educators and researchers this definitive resource provides 7100 concise articles covering disciplines of science and technology from acoustics to zoology Extensively revised content with new and rewritten articles Current and critical advances in fast developing fields such as biomedical science chemistry computing and information technology cosmology environmental science nanotechnology telecommunications and physics More than 1600 two color illustrations 75 full color plates Hundreds of tables and charts 1300 biographical sketches of famous scientists Index containing 30 000 entries Cross references to related articles Appendices including bibliographies and useful data McGraw Hill Professional science reference products are supported by MHEST com a website offering updates to articles periodic special features on important scientific topics multimedia content and other features enriching the reader s experience We encourage readers to visit the site often Fields Covered Include Acoustics Aeronautics Agriculture Anthropology Archeology Astronomy Biochemistry Biology Chemistry Computers Cosmology Earth Science Engineering Environmental Science Forensic Science Forestry Genetics Geography Immunology Information Science Materials Science Mathematics Medicine and Pathology Meteorology and Climate Science Microbiology Nanotechnology Navigation Neuroscience Oceanography Paleontology Physics Physiology Psychiatry Psychology Telecommunications Theoretical Physics Thermodynamics Veterinary Medicine Virology Zoology **Tests** Richard C. Sweetland,Daniel J. Keyser,1983 Descriptions of over 3000 tests in English intended as a guide for psychologists educators and other personnel who need test information to meet their assessment needs Topical arrangement under 3 main sections of psychology education and business Each entry gives test name associated personal names intended age group purpose description time range scoring cost and publisher Indexes by test titles authors publishers visually impaired tests and scoring services

**Physics Briefs** ,1994     *Handbook of Surfaces and Interfaces of Materials: Nanostructured materials, micelles and colloids* Hari Singh Nalwa,2001 This handbook brings together under a single cover all aspects of the chemistry physics and engineering of surfaces and interfaces of materials currently studied in academic and industrial research It covers different experimental and theoretical aspects of surfaces and interfaces their physical properties and spectroscopic techniques that have been applied to a wide class of inorganic organic polymer and biological materials The diversified technological areas of surface science reflect the explosion of scientific information on surfaces and interfaces of materials and their spectroscopic characterization The large volume of experimental data on chemistry physics and engineering aspects of materials surfaces and interfaces remains scattered in so many different periodicals therefore this handbook compilation is needed The information presented in this multivolume reference draws on two decades of pioneering research on the surfaces and interfaces of materials to offer a complete perspective on the topic These five volumes Surface and Interface Phenomena Surface Characterization and Properties Nanostructures Micelles and Colloids Thin Films and Layers Biointerfaces and Applications provide multidisciplinary review chapters and summarize the current status of the field covering important scientific and technological developments made over past decades in surfaces and interfaces of materials and spectroscopic techniques with contributions from internationally recognized experts from all over the world Fully cross referenced this book has clear precise and wide appeal as an essential reference source long due for the scientific community The complete reference on the topic of surfaces and interfaces of materials The information presented in this multivolume reference draws on two decades of pioneering research Provides multidisciplinary review chapters and summarizes the current status of the field Covers important scientific and technological developments made over past decades in surfaces and interfaces of materials and spectroscopic techniques Contributions from internationally recognized experts from all over the world

*Announcer* American Association of Physics Teachers,2003     **Canadian Journal of Physics** ,2015     **Geometrical Structure in Semiclassical Trace Formulas** Stephen Christopher Creagh,1991     *Subject Guide to Books in Print* ,1991

**Science Abstracts** ,1958     Problems and Solutions on Quantum Mechanics Yung-Kuo Lim,1998 The material for these volumes has been selected from 20 years of examination questions for graduate students at the University of California at Berkeley Columbia University University of Chicago MIT SUNY at Buffalo Princeton University and the University of

Soviet Physics, JETP. ,1985     **Government Reports Announcements & Index** ,1985-05

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