

PHYS 410 Homework # 8

6.1. On a spherical surface, the longitude and latitude lines are orthogonal.



For a small change in position, we have the change in longitude and latitude:

$$ds_{\phi} = R \cdot d\theta, \quad ds_{\lambda} = R \sin\theta \cdot d\phi$$

$$\Rightarrow ds = \sqrt{ds_{\phi}^2 + ds_{\lambda}^2} = R \cdot d\theta \sqrt{1 + \sin^2\theta \frac{d\phi^2}{d\theta^2}}$$

$$\Rightarrow L = \int_{\theta_1}^{\theta_2} ds = R \int_{\theta_1}^{\theta_2} \sqrt{1 + \sin^2\theta \frac{d\phi^2}{d\theta^2}} \cdot d\theta$$

6.3



$$L(P, Q) = \sqrt{x_1^2 + y_1^2 + z_1^2} + \sqrt{x_2^2 + y_2^2 + z_2^2}$$

$$\Rightarrow T = L/c$$

According to Fermat's principle, we get:

$$\frac{\partial T}{\partial x} = 0, \quad \frac{\partial T}{\partial y} = 0.$$

$$\frac{\partial T}{\partial z} = 0 \Rightarrow 2 \cdot \left( \frac{1}{\sqrt{x_1^2 + y_1^2 + z_1^2}} + \frac{1}{\sqrt{x_2^2 + y_2^2 + z_2^2}} \right) = 0 \Rightarrow z = 0 \quad (1)$$

$$\frac{\partial T}{\partial x} = 0 \Rightarrow \frac{x_1}{\sqrt{x_1^2 + y_1^2 + z_1^2}} + \frac{x_2}{\sqrt{x_2^2 + y_2^2 + z_2^2}} = 0 \quad (2)$$



According to (1), when  $z=0$ , we get from (2):

$$\sin\theta_1 = \sin\theta_2$$

$$\Rightarrow \theta_1 = \theta_2$$

6.5



According to General Geometric relation, we know  $\angle APB = \frac{\theta}{2}$ .

$$\text{And } \alpha = \frac{\theta - \theta}{2}$$

$$\Rightarrow AP = AB \cdot \sin(\frac{\theta}{2} - \alpha) = AB \cos \frac{\alpha}{2} = AB \sin \frac{\theta}{2} = 2R \sin \frac{\theta}{2}$$

$$BP = AB \cdot \sin \alpha = 2R \cdot \cos \frac{\theta}{2}$$

$$\Rightarrow APB = 2R \cdot (\sin \frac{\theta}{2} + \cos \frac{\theta}{2}) = 2\sqrt{2} \sin(\frac{\theta}{2} + \frac{\pi}{4}) R$$

$$\Rightarrow (APB)_{max} = 2\sqrt{2} R \text{ when } \theta = \frac{\pi}{2}, \text{ which is the real path.}$$

6.7

(2.4.2)



In cylinder coordinates, when  $R$  is const, the infinitesimal change in position corresponds to

$$ds = \sqrt{R^2 d\phi^2 + dz^2} = dz \sqrt{1 + R^2 \frac{d\phi^2}{dz^2}} = f(\phi, z) dz$$

$$\Rightarrow L = \int_{\phi_1}^{\phi_2} ds = \int_{z_1}^{z_2} f(\phi, z) dz$$

# Classical Mechanics Problem Solutions

**Ioan Merches, Daniel Radu**



## **Classical Mechanics Problem Solutions:**

**Classical Mechanics** Konstantin Konstantinovich Likharev, 2017 Essential Advanced Physics is a series comprising four parts Classical Mechanics Classical Electrodynamics Quantum Mechanics and Statistical Mechanics Each part consists of two volumes Lecture notes and Problems with solutions further supplemented by an additional collection of test problems and solutions available to qualifying university instructors This volume Classical Mechanics Problems with solutions contains detailed model solutions to the exercise problems formulated in the companion Lecture notes volume In many cases the solutions include result discussions that enhance the lecture material For the reader's convenience the problem assignments are reproduced in this volume Source r sum de l diteur *Solution Manual For Classical Mechanics And Electrodynamics (Second Edition)*. Jon Magne Leinaas, 2025 *Solved Problems in Classical Mechanics* O. L. de Lange, J. Pierrus, 2010-05-06 Apart from an introductory chapter giving a brief summary of Newtonian and Lagrangian mechanics this book consists entirely of questions and solutions on topics in classical mechanics that will be encountered in undergraduate and graduate courses These include one two and three dimensional motion linear and nonlinear oscillations energy potentials momentum and angular momentum spherically symmetric potentials multi particle systems rigid bodies translation and rotation of the reference frame the relativity principle and some of its consequences The solutions are followed by a set of comments intended to stimulate inductive reasoning and provide additional information of interest Both analytical and numerical computer techniques are used to obtain and analyze solutions The computer calculations use Mathematica version 7 and the relevant code is given in the text It includes use of the interactive Manipulate function which enables one to observe simulated motion on a computer screen and to study the effects of changing parameters The book will be useful to students and lecturers in undergraduate and graduate courses on classical mechanics and students and lecturers in courses in computational physics [Cognitive Structures in Scientific Inquiry](#), 2016-08-01 This book is the second of two volumes devoted to the work of Theo Kuipers a leading Dutch philosopher of science Philosophers and scientists from all over the world thirty seven in all comment on Kuipers philosophy and each of their commentaries is followed by a reply from Kuipers The present volume is devoted to Kuipers neo classical philosophy of science as laid down in his *Structures in Science* Kluwer 2001 Kuipers defends a dialectical interaction between science and philosophy in that he views philosophy of science as a meta science which formulates cognitive structures that provide heuristic patterns for actual scientific research including design research In addition Kuipers pays considerable attention to the computational approaches to philosophy of science as well as to the ethics of doing research Thomas Nickles David Atkinson Jean Paul van Bendegem Maarten Franssen Anne Ruth Mackor Arno Wouters Erik Weber Helena de Preester Eric Scerri Adam Grobler Andrzej Wisniewski Alexander van den Bosch Gerard Vreeswijk Jaap Kamps Paul Thagard Emma Ruttkamp Robert Causey Henk Zandvoort comment on these ideas of Kuipers and many present their own account The present book also contains a synopsis of *Structures in Science* It can be

read independently of the first volume of Essays in Debate with Theo Kuipers which is devoted to Kuipers From Instrumentalism to Constructive Realism 2000 **Cognitive Structures in Scientific Inquiry** Roberto Festa, Atocha Aliseda, Adriana Johanna Maria Peijnenburg, 2005 This book is the first of two volumes devoted to the work of Theo Kuipers a leading Dutch philosopher of science Philosophers and scientists from all over the world thirty seven in all comment on Kuipers philosophy and each of their commentaries is followed by a reply from Kuipers The present volume focuses on Kuipers views on confirmation empirical progress and truth approximation as laid down in his From Instrumentalism to Constructive Realism Kluwer 2000 In this book Kuipers offered a synthesis of Carnap s and Hempel s confirmation theory on the one hand and Popper s theory of truth approximation on the other The key element of this synthesis is a sophisticated methodology which enables the evaluation of theories in terms of their problems and successes even if the theories are already falsified and which also fits well with the claim that one theory is closer to the truth than another Ilkka Niiniluoto Patrick Maher John Welch Gerhard Schurz Igor Douven Bert Hamminga David Miller Johan van Benthem Sjoerd Zwart Thomas Mormann Jes s Zamora Bonilla Isabella Burger andamp Johannes Heidema Joke Meheus Hans Mooij and Diderik Batens comment on these ideas of Kuipers and many present their own account The present book also contains a synopsis of From Instrumentalism to Constructive Realism It can be read independently of the second volume of Essays in Debate with Theo Kuipers which is devoted to Kuipers Structures in Science 2001 **The Mechanics Problem Solver** Research and Education Association, 1995 **Collected Papers on Wave Mechanics** Erwin Schrödinger, 1928 **Thinking Across Cultures** Donald M. Topping, Doris C. Crowell, Victor N. Kobayashi, 2013-09-05 This volume compares and contrasts contemporary theories of cognition modes of perception and learning from cross cultural perspectives The participants were asked to consider and assess the question of whether people from different cultures think differently Moreover they were asked to consider whether the same approaches to teaching and development of thinking will work in all cultures as well as they do in Western literate societies **Introduction To Classical Mechanics: Solutions To Problems** John Dirk Walecka, 2020-08-24 The textbook Introduction to Classical Mechanics aims to provide a clear and concise set of lectures that take one from the introduction and application of Newton s laws up to Hamilton s principle of stationary action and the lagrangian mechanics of continuous systems An extensive set of accessible problems enhances and extends the coverage It serves as a prequel to the author s recently published book entitled Introduction to Electricity and Magnetism based on an introductory course taught some time ago at Stanford with over 400 students enrolled Both lectures assume a good concurrent course in calculus and familiarity with basic concepts in physics the development is otherwise self contained As an aid for teaching and learning and as was previously done with the publication of Introduction to Electricity and Magnetism Solutions to Problems this additional book provides the solutions to the problems in the text Introduction to Classical Mechanics **Proceedings of the Royal Society of London** Royal Society (Great Britain), 1926 **Scientific and**

**Technical Aerospace Reports** ,1967 *Classical Mechanics Student Solutions Manual* John R Taylor,Jeff Adams,Greg Francis,2020-07-10 This is the authorized Student Solutions Manual for John R Taylor s internationally best selling textbook Classical Mechanics In response to popular demand University Science Books is delighted to announce the one and only authorized Student Solutions Manual for John R Taylor s internationally best selling textbook Classical Mechanics This splendid little manual by the textbook s own author restates the odd numbered problems from the book and the provides crystal clear detailed solutions Of course the author strongly recommends that students avoid sneaking a peek at these solutions until after attempting to solve the problems on their own But for those who put in the effort this manual will be an invaluable study aid to help students who take a wrong turn who can t go any further on their own or who simply wish to check their work Now available in print and ebook formats [PSA 1974](#) Robert S. Cohen,C.A. Hooker,Alex C. Michalos,J. van Evra,2012-12-06 For this book we have selected papers from symposia and contributed sessions at the fourth biennial meeting of the Philosophy of Science Association held at the University of Notre Dame on November 1 3 1974 The meeting was lively and well attended and we regret that there was no way to record here the many stimulating discussions after the papers and during the informal hours We also regret that we had in sufficient space for all the contributed papers Even more some of the symposia were not available those on systems and decision theory c W Churchman P Suppes I Levi and on the Marxist philosophy of science M W Wartofsky R S Cohen E N Hiebert Unhappily several individual contributions to other symposia were likewise not available I Velikovsky in the session on his own work and the politics of science D Finkelstein in the session on quantum logic Memorial minutes were read for Alan Ross Anderson prepared by Nuel Belnap and for Imre Lakatos prepared by Paul Feyerabend They initiate this volume of philosophy of science in the mid seventies [Analytical Mechanics](#) Ioan Merches,Daniel Radu,2014-08-26 Giving students a thorough grounding in basic problems and their solutions Analytical Mechanics Solutions to Problems in Classical Physics presents a short theoretical description of the principles and methods of analytical mechanics followed by solved problems The authors thoroughly discuss solutions to the problems by taking a comprehensive a **Proceedings** ,1930 [Quantum Mechanics](#) Edward Uhler Condon,Philip McCord Morse,1929 First published in 1929 this remarkable collaboration is an outline of the known results obtained by use of the quantum mechanics It analyzes developments in knowledge of atomic structure and the interpretation of spectroscopic and electronic phenomena during a period which was one of the most exciting in the history of theoretical physics as the authors say in their Preface Back cover **Rethinking Scientific Change and Theory Comparison:** Léna Soler,H. Sankey,Paul Hoyningen-Huene,2008-05-29 L NA SOLER This volume is a collection of essays devoted to the analysis of scientific change and stability It represents the most recent thinking on the topic of incommensurability and scientific theory change It explores the balance and tension that exists between commensurability and continuity or stabilities on the one hand and incommensurability and discontinuity or ruptures on the other And it discusses some central epistemological consequences

regarding the nature of scientific progress rationality and realism With respect to these topics it investigates a number of new avenues and revisits some familiar issues with a focus on the history and philosophy of physics in a way that is informed by developments in cognitive sciences as well as the claims of New experimentalists The essays in this book are fully revised versions of papers which were originally presented at the international colloquium *Repenser l'valuation comparative des theories scientifiques stabilit s ruptures incommensurabilit s* organized by Lina Soler and Paul Hoyningen Huene at the University of Nancy France in June 2004 Each paper is followed by a critical comment which either represents an opposing viewpoint or suggests some developments The conference was a striking example of the sort of genuine dialogue that can take place between philosophers of science historians of science and scientists who come from different traditions and endorse opposing commitments I hope that this is evident in the book too and that it will constitute one of its attractions

*Proceedings of the Twenty-second Annual Conference of the Cognitive Science Society* Lila R. Gleitman, Aravind K. Joshi, 2000 Vol includes all papers posters presented at 2000 Cog Sci mtg summaries of symposia invited addresses Deals with issues of representing modeling cognitive processes appeals to scholars in all subdisciplines that comprise cognitive science psychology computer science neuro science linguistics philosophy

**Proceedings** Ohio State Educational Conference, 1930

**Essential Classical Mechanics** Choonkyu Lee, 1998

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