

GRIFFITHS ELECTRODYNAMICS SOLUTIONS

KALMAN KNIZHNIK

Problem 2.1

a) Twelve equal charges, q are situated at the corners of a regular 12-sided polygon (for instance, one on each numeral of a clock face.) What is the net force on a test charge Q at the center?

The force on Q must be 0 by symmetry. The x , y , and z components of the fields due to each charge cancel, so the force vanishes.

b) Suppose one of the 12 q 's is removed (the one at "6 o'clock"). What is the force on Q ? Explain your reasoning carefully.

Now it is like 10 of the charges cancel, the only one that doesn't cancel being the one directly opposite the missing charge. Thus, the force is

$$F = \frac{1}{4\pi\epsilon_0} \frac{qQ}{r^2} \quad \square \quad (1)$$

pointing in the direction of the missing charge. Here, r is the distance from the center to each charge.

c) Now 13 equal charges, q , are placed at the corners of a regular 13-sided polygon. What is the force on a test charge Q at the center.

Again, by symmetry, the answer is still 0.

d) If one of the 13 q 's is removed, what is the force on Q ? Explain your reasoning.

The same answer as in part b, equation 1, and for the same reason.

Problem 2.2

a) Find the electric field (magnitude and direction) a distance z above the midpoint between two equal charges, q , a distance d apart. Check that your result is consistent with what you'd expect when $z \gg d$.

The force would not have components in the y or x direction, if we put the charges in the $x - z$ plane, there is no y -component of the field at the point in question, and the x -components cancel. The z -component of the field is

$$\mathbf{E} = \frac{1}{4\pi\epsilon_0} \frac{2q}{z^2 + (d/2)^2} \sin(\theta) \hat{\mathbf{z}} = \frac{1}{4\pi\epsilon_0} \frac{2qz}{(z^2 + (d/2)^2)^{3/2}} \hat{\mathbf{z}} \quad \square \quad (2)$$

where the factor of 2 comes from adding up the two charges. When $z \gg d$, the electric field becomes

$$\mathbf{E} = \frac{1}{4\pi\epsilon_0} \frac{2q}{z^2} \hat{\mathbf{z}} \quad (3)$$

which is what you would expect, since the system acts like a point charge of charge $2q$.

b) Repeat part (a), only this time make the right hand charge $-q$ instead of $+q$.

Now the z -components cancel and the x -components don't. Mathematically, this means replacing $\sin(\theta)$ with $\cos(\theta)$.

$$\mathbf{E} = \frac{1}{4\pi\epsilon_0} \frac{2q}{z^2 + (d/2)^2} \cos(\theta) \hat{\mathbf{x}} = \frac{1}{4\pi\epsilon_0} \frac{qd}{(z^2 + (d/2)^2)^{3/2}} \hat{\mathbf{x}} \quad \square \quad (4)$$

where the 2 has canceled out with the $d/2$ that comes from the cosine. If $z \gg d$, then from far away it looks like a dipole, and the field reduces to that of a dipole:

$$\mathbf{E} = \frac{1}{4\pi\epsilon_0} \frac{qd}{z^3} \hat{\mathbf{x}} \quad (5)$$

Manual Solution For Electrodynamic

AW Rasmussen



Manual Solution For Electrodynamic:

Solution Manual For Classical Mechanics And Electrodynamics (Second Edition). Jon Magne Leinaas,2025

Solution Manual for Classical Mechanics and Electrodynamics Jon Magne Leinaas,2019 *Solut Man Classic Mech. . (2nd Ed) Hb* LEINAAS,2025-02-16 As the essential companion book to the second edition of World Scientific 2024 a textbook which aims to provide a general introduction to classical theoretical physics in the fields of mechanics relativity electromagnetism and classical field theory this book provides worked solutions to the exercises in the textbook Detailed explanations are laid out to aid the reader in advancing their understanding of the concepts and applications expounded in the textbook *Solutions for Problems in Classical Electrodynamics* Julian J.-L. Ting,2005 **Macroscopic**

Electrodynamics Instructor's Solutions Guide Walter Wilcox,Chris Thron,2016-01-07 This instructor s solutions guide accompanies our introductory graduate electrodynamics textbook Macroscopic Electrodynamics We emphasize that this is a guide and not a step by step exposition for the 391 problems furnished in the text Helpful indications of starting points and methods are given as well as enough intermediate steps and occasional final results that a knowledgeable instructor can readily fill in the gaps This approach is designed to provide the instructor with a powerful and time saving teaching aid for introducing students to this beautiful and wide ranging subject This access is given only to instructors who are adopting the textbook for their classes To gain access to this title please fill in the adoption form and we will get back to you soon Request Inspection Copy **Introduction to Electrodynamics** David J. Griffiths,2017-06-29 This is a re issued and affordable printing of the widely used undergraduate electrodynamics textbook **Electrodynamics** Carolina C. Ilie,Zachariah S. Schrecengost,2018-05-29 This book of problems and solutions is a natural continuation of Ilie and Schrecengost s first book Electromagnetism Problems and Solutions As with the first book this book is written for junior or senior undergraduate students and for graduate students who may have not studied electrodynamics yet and who may want to work on more problems and have an immediate feedback while studying This book of problems and solutions is a companion for the student who would like to work independently on more electrodynamics problems in order to deepen their understanding and problem solving skills and perhaps prepare for graduate school This book discusses main concepts and techniques related to Maxwell s equations conservation laws electromagnetic waves potentials and fields and radiation Instructor's Solutions Manual for Brau's Modern Problems in Classical Electrodynamics Charles A. Brau,Charles H. Boulware,2004 Instructor s Solutions Manual to accompany Modern Problems in Classical Electrodynamics is a supplement to Brau s main text It contains solutions to the problems in the textbook and it is available free of charge to adopting professors

Electrodynamics: The Field-Free Approach Kjell Prytz,2015-03-19 This book is intended as an undergraduate textbook in electrodynamics at basic or advanced level The objective is to attain a general understanding of the electrodynamic theory and its basic experiments and phenomena in order to form a foundation for further studies in the engineering sciences as

well as in modern quantum physics The outline of the book is obtained from the following principles Base the theory on the concept of force and mutual interaction Connect the theory to experiments and observations accessible to the student Treat the electric magnetic and inductive phenomena cohesively with respect to force energy dipoles and material Present electrodynamics using the same principles as in the preceding mechanics course Aim at explaining that theory of relativity is based on the magnetic effect Introduce field theory after the basic phenomena have been explored in terms of force Although electrodynamics is described in this book from its 1st principles prior knowledge of about one semester of university studies in mathematics and physics is required including vector algebra integral and differential calculus as well as a course in mechanics treating Newton's laws and the energy principle The target groups are physics and engineering students as well as professionals in the field such as high school teachers and employees in the telecom industry Chemistry and computer science students may also benefit from the book Modern Electrodynamics Andrew Zangwill,2013 An engaging writing style and a strong focus on the physics make this graduate level textbook a must have for electromagnetism students

Physics for Scientists and Engineers, Volume 2B: Electrodynamics; Light Paul Allen Tipler,2004

Electrodynamics Wolfgang Pauli,Charles P. Enz,2000-01-01 In the 1950s the distinguished theoretical physicist Wolfgang Pauli delivered a landmark series of lectures at the Swiss Federal Institute of Technology in Zurich His comprehensive coverage of the fundamentals of classical and modern physics was painstakingly recorded not only by his students but also by a number of collaborators whose carefully edited transcriptions resulted in a remarkable six volume work This volume the first of the series presents a brief survey of the historical development and then current problems of electrodynamics followed by sections on electrostatics and magnetostatics steady state currents quasi static fields and rapidly varying fields As does each book in the series Volume 1 includes an index and a wealth of helpful figures and can be read independently of the series by those who wish to focus on a particular topic Originally published in 1973 the text remains entirely relevant thanks to Pauli's manner of presentation As Victor F Weisskopf notes in the Foreword to the series Pauli's style is commensurate to the greatness of its subject in its clarity and impact Pauli's lectures show how physical ideas can be presented clearly and in good mathematical form without being hidden in formalistic expertise Alone or as part of the complete set this volume represents a peerless resource invaluable to individuals libraries and other institutions

Electrodynamics Tutorials with Python Simulations Taejoon Kouh,Minjoon Kouh,2024-04-08 This book provides an accessible introduction to intermediate level electrodynamics with computational approaches to complement a traditional mathematical treatment of the subject It covers key topics in electrodynamics such as electromagnetic fields forces potentials and waves as well as Special Theory of Relativity Through intuition building examples and visualizations in the Python programming language it helps readers to develop technical computing skills in numerical and symbolic calculations modeling and simulations and visualizations Python is a highly readable and practical programming language making this

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