Richard H. Enns
George C. McGuire

A Laboratory
Manual for

NONLINEAR
PHYSICS
with Maple
for Scientists
and Engineers

Nonlinear Physics With Maple For Scientists And Engineers

AW Rasmussen

Nonlinear Physics With Maple For Scientists And Engineers:

  Nonlinear Physics with Maple for Scientists and Engineers Richard Enns,George McGuire,2013-11-27 Philosophy of the Text This text has been designed to be an introductory survey of the basic concepts and applied mathematical methods of nonlinear science Students in engineer ing physics chemistry mathematics computing science and biology should be able to successfully use this text In an effort to provide the students with a cutting edge approach to one of the most dynamic often subtle complex and still rapidly evolving areas of modern research nonlinear physics we have made extensive use of the symbolic numeric and plotting capabilities of Maple V Release 4 applied to examples from these disciplines No prior knowledge of Maple or computer programming is assumed the reader being gently introduced to Maple as an auxiliary tool as the concepts of nonlinear science are developed The diskette which accompanies the text gives a wide variety of illustrative nonlinear examples solved with Maple An accompanying laboratory manual of experimental activities keyed to the text allows the student the option of hands on experience in exploring nonlinear phenomena in the REAL world Although the experiments are easy to perform they give rise to experimental and theoretical complexities which are not to be underestimated The Level of the Text The essential prerequisites for the first eight chapters of this text would nor mally be one semester of ordinary differential equations and an intermediate course in classical mechanics   **Nonlinear Physics with Maple for Scientists and Engineers** Richard H Enns,George C McGuire,2000-05-11   **Nonlinear Physics with Maple for Scientists and Engineers / Experimental Activities in Nonlinear Physics** Richard Enns,George McGuire,1997-03-20   **Laboratory Manual for Nonlinear Physics with Maple for Scientists and Engineers** Richard H. Enns,George McGuire,2012-12-06 Science demands that all theory must be checked by experiment Richard Feyn man Nobel Laureate in physics 1965 reminds us in a wonderful quote that The test of all knowledge is experiment Experiment is the sole judge of sci entific truth 1 It is because nonlinear physics can be so profoundly counter intuitive that these laboratory investigations are so important This manual is designed to be used with the text Nonlinear Physics with Maple for Scientists and Engineers Understanding is enhanced when experiments are used to check so please attempt as many of the activities as you can As you perform theory these activities we hope that you will be amazed and startled by strange behav ior intrigued and terrorized by new ideas and be able to amaze your friends as you relate your strange sightings Remember that imagination is just as impor tant as knowledge so exercise yours whenever possible But please be careful as nonlinear activities can be addicting can provide fond memories and can awaken an interest that lasts a lifetime Although it has been said that a rose by any other name is still a rose with apologies to Shakespeare the authors of this laboratory manual have in an endeavor to encourage the use of these nonlinear investigations called them experimental activities rather than experiments A number of design innovations have been introduced A   Nonlinear Physics with Maple for Scientists and Engineers Richard H. Enns,George C. McGuire,2012-12-06 Philosophy of the Text This text presents an introductory survey

of the basic concepts and applied mathematical methods of nonlinear science as well as an introduction to some simple related nonlinear experimental activities Students in engineering phys ics chemistry mathematics computing science and biology should be able to successfully use this book In an effort to provide the reader with a cutting edge approach to one of the most dynamic often subtle complex and still rapidly evolving areas of modern research nonlinear physics we have made extensive use of the symbolic numeric and plotting capabilities of the Maple software sys tem applied to examples from these disciplines No prior knowledge of Maple or computer programming is assumed the reader being gently introduced to Maple as an auxiliary tool as the concepts of nonlinear science are developed The CD ROM provided with this book gives a wide variety of illustrative non linear examples solved with Maple In addition numerous annotated examples are sprinkled throughout the text and also placed on the CD An accompanying set of experimental activities keyed to the theory developed in Part I of the book is given in Part II These activities allow the student the option of hands on experience in exploring nonlinear phenomena in the REAL world Although the experiments are easy to perform they give rise to experimental and theoretical complexities which are not to be underestimated   Nonlinear Physics with Mathematica for Scientists and Engineers Richard H. Enns,George C. McGuire,2001-06-26 Nonlinear physics continues to be an area of dynamic modern research with applications to physics engineering chemistry mathematics computer science biology medicine and economics In this text extensive use is made of the Mathematica computer algebra system No prior knowledge of Mathematica or programming is assumed This book includes 33 experimental activities that are designed to deepen and broaden the reader s understanding of nonlinear physics These activities are correlated with Part I the theoretical framework of the text

Computer Algebra Recipes for Mathematical Physics Richard H. Enns,2006-03-20 Over two hundred novel and innovative computer algebra worksheets or recipes will enable readers in engineering physics and mathematics to easily and rapidly solve and explore most problems they encounter in their mathematical physics studies While the aim of this text is to illustrate applications a brief synopsis of the fundamentals for each topic is presented the topics being organized to correlate with those found in traditional mathematical physics texts The recipes are presented in the form of stories and anecdotes a pedagogical approach that makes a mathematically challenging subject easier and more fun to learn This is a self contained and standalone text using MAPLE that may be used in the classroom for self study as a reference or as a text for an online course   **Computer Algebra Recipes** Richard Enns,George C. McGuire,2013-03-07 Computer algebra systems have the potential to revolutionize the teaching of and learning of science Not only can students work thorough mathematical models much more efficiently and with fewer errors than with pencil and paper they can also work with much more complex and computationally intensive models Thus for example in studying the flight of a golf ball students can begin with the simple parabolic trajectory but then add the effects of lift and drag of winds and of spin Not only can the program provide analytic solutions in some cases it can also produce numerical solutions and graphic displays Aimed at undergraduates in their

second or third year this book is filled with examples from a wide variety of disciplines including biology economics medicine engineering game theory physics chemistry The text is organized along a spiral revisiting general topics such as graphics symbolic computation and numerical simulation in greater detail and more depth at each turn of the spiral The heart of the text is a large number of computer algebra recipes These have been designed not only to provide tools for problem solving but also to stimulate the reader s imagination Associated with each recipe is a scientific model or method and a story that leads the reader through steps of the recipe Each section of recipes is followed by a set of problems that readers can use to check their understanding or to develop the topic further   <u>Computer Algebra Recipes for Classical Mechanics</u> Richard H. Enns,George C. McGuire,2012-12-06 Hundreds of novel and innovative computer algebra recipes will enable readers starting at the second year undergraduate level to easily and rapidly solve and explore most problems they encounter in their classical mechanics studies Using the powerful computer algebra system MAPLE Release 8 no prior knowledge of MAPLE is presumed the relevant command structures are explained on a need to know basis as the recipes are developed This new problem solving guide can serve in the classroom or for self study for reference or as a text for an on line course

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