

Introduction

About thirty years ago, David Park wrote a book on Quantum Theory in which he advised the student to determine whether the difficulty in solving a problem was in the Physics or in the Mathematics. With the great amount of progress in numerical methods and with the speed of the modern personal computer, the problem is no longer in the mathematics. Now it is sufficient to set up the correct Physics equations and utilize any of the excellent mathematical softwares to graph and solve the problem.

The computer solutions in this book are primarily written in *Mathematica* because of its reasonably straightforward approach to mathematical problem-solving. It should be noted that the computational powers of *Maple* and *MatLab* are equally good. A comparison of *Mathematica*, *Maple*, and *MatLab* is given in Appendix A.

The programming with *Mathematica* 5 should present few difficulties. There are 50-plus computer solutions from physics and engineering and 10-plus animations contained on the compact disc. Any of the *Mathematica* programs on the CD may be run with *Mathematica* Player or *Mathematica* 5, 6 or 7 as appropriate, and *MatLab* programs may be run with any version of *MatLab* 7. Once a program from the CD is on your computer, you may change the conditions or modify the equations to address a problem of your choosing. A listing of all programs is given in Appendix B. If you have never used *Mathematica* before, a capsule summary of *Mathematica* commands is given in Appendix C, and a summary of *MatLab* commands is given in Appendix D.

It is important to note that this is not a first-year textbook on Physics. Anyone who wants to program Physics equations should have at least one year of College Physics and a good introduction to the Calculus.

Here is the premise of this text: If you can write down the correct Physics equations, then it is only necessary to program a few lines of code to get the answer. And if the Physics equations are not correct, then the program output will tell you that as well. Either way, you win. Let's get started by setting up some Physics equations ... and let the computer knock them down.