Preface

Italian students start studying Quantum and Statistical Mechanics in the last year of their undergraduate studies. Many physicists think these subjects are the core of an education in physics. At the same time, these two subjects are not easily learnt by the average student. In Italy the final exam is divided in two separate parts: there is, in fact, a written and an oral one. Most textbooks concentrate on the principles of the theory and the applications are dealt with at the end of each chapter under the headings 'problems' or 'exercises'. Most of the times the latter consist only of the text of the problem with some vague indications on how to proceed with the solution. Some other times the solution is completely left to the student. The authors of the present book think this is didactically wrong: these applications are crucial for a correct understanding of the subject and help the students get acquainted with the mathematical tools they have learnt in other classes. Many times we have noticed that a simple change in the denominations of the letters was enough to throw a student in disarray: a function whose behaviour was familiar when the independent variable was called x, became unfathomable when the very same variable was the energy E. In reality, during the elementary study of classical physics, the exercises are mostly straightforward applications of the general formulae deduced from experience or at the most require the simplest notions of differential and integral calculus. Things change with Quantum and Statistical Mechanics whose mathematical formalism is more complex. Also the problems and exercises reflect this point and the required solutions often need longer and more elaborate manipulations.

It is for these reasons that in our teaching we have always dedicated a large amount of time to the discussion of the applications, to the correction of the problems, and have tried to elaborate written solutions with lengthy discussions to help the students get ready for the written exams. From this point to the publication of our notes it has been a natural step.

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