From the points of view, then, of starting very simply, of developing certain mathematical tools which are central to finite elements (that which not every reader of this book will have at his finger tips) and of the general level of mathematical presentation and rigour, this book is very suitable indeed as an introduction to its subject for final year undergraduate mathematicians and to those physicists and engineers who have been exposed to a fairly mathematical upbringing.

To be added to the foregoing is the rather comprehensive nature of this text. The usual treatment of Elliptic problems, including error estimates, is followed by two chapters on solution by both direct and iteration methods. These two chapters, moreover, are up-to-date: the fact that the book has been written fairly recently is obvious. Many texts ignore almost entirely the solution of the stiffness equations, to have accounts of both direct and iterative methods for solving them is, to say the least, refreshing, while it is of course most welcome.

Following on from this there are substantial chapters on both parabolic and hyperbolic problems and also one on the boundary element method. The important topic of curved elements and isoparametric transformations receives perhaps a treatment which is too cursory.

The book contains many examples of the finite element method applied to a range of physical problems and an adequate set of exercises. It should be added that, while the book concentrates (of course) on linear problems, non-linear ones are by no means ignored: there is a not insubstantial chapter on them.

The book has a few misprints but the reviewer has not noticed many: the principal objection to this text is the fact that pages 67, 68 and 79, 80 are (rather badly) "stuck in"—even in the (expensive) hardback edition. The two sheets carrying these four pages could well "drop out" with even average use and this somewhat shabby example of production in a book from the press which publishes it, came as a rather unpleasant surprise to the reviewer. The hardback edition should surely have its price discounted somewhat. Despite this, however, this text is warmly welcome on my shelves and should do well as an undergraduate text.

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Most second editions indicate that the original had the ingredients of a good and timely text which found wide appeal with both lecturers and students. I first taught control theory some ten years ago and found the first edition to be clearly organized mathematically and accessible to the ordinary student. The main drawback to the first edition was clear. The exercises were few and far between. This defect has obviously been given a high priority in the new edition. As before, the answers, where appropriate, have been given in a section at the end of the book.

The first part of the book assumes that the control system comes prepackaged with a system of ordinary differential equations in state space \((x)\) with controls \((u)\) together with an output \((y)\) which is a function of \(x\) and \(u\). This is literally an ideal situation in several ways. First, the lecturer can use phase portrait techniques to show how the system might respond to various controls at various initial points. Unfortunately, this geometric approach is not used as well as it could be in this text. Second, given a control system, it is not difficult to see how for a given initial state, the output can be seen directly as a function of the control. Obviously, in practice, things may be less than ideal and it may be that a relationship between \(u\) and \(y\) is the most tractable form of information. For example, without knowing the precise workings of a machine, we are able to see how it performs by twiddling knobs \((u)\) and observing the corresponding output \((y)\). For this simple reason, analysis of input/output data is the most likely way an engineer might encounter a control system. We now have the problem of finding out about the control system from this information.
REVIEWS

For a linear control model, the input/output relation is a matrix of rational functions. The zeroes and poles of the various matrix entries give information on the stability characteristics of the control system. This is the engineering oriented "frequency domain" approach to linear multivariable systems which is much more extensively covered in the second edition.

The new edition has significant changes from its predecessor. These changes give the second edition a timeliness which the original text had in 1975 and they have enabled the book to stay in tune with the fast moving subject of control theory.

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This is a short text which adopts a very traditional view throughout and would be a useful acquisition to undergraduates in the physical sciences attending courses in statistical mechanics. The author and I share the experience of teaching statistical mechanics to final year mathematicians, hence I can easily agree with his view that this task presents special difficulties. Most of us who perform this task however disagree on almost everything else! Statistical mechanics is a fundamental component of modern mathematical physics but it is also a subject servicing the physical sciences. The applications of statistical mechanics to strongly interacting systems is a field very rich in mathematical modelling making contact with many areas of both pure and applied mathematics. These problems which are of renowned difficulty are also problems of great mathematical interest and continue to stimulate, and be stimulated by, developments in other areas of mathematics. As a discipline servicing the physical sciences one cannot really hope to tackle these problems and as in this book applications are usually confined to simple non-interacting classical and quantum systems. With a class of strong mathematicians however it is possible to take the subject into such problems and it is mainly here that I have found it possible to stimulate mathematics students into a keen interest.

This book which has two chapters on thermodynamics is rather traditional; Tolman, Fowler, and Pippard are never far away. The trick of cell division of classical phase space is used to establish density distributions. The canonical ensemble makes but a brief appearance, its importance in dealing with interacting systems is not clear, and neither is the corresponding Gibb's measure as a continuous distribution on phase space clearly stated. All applications are to non-interacting systems and I feel that the mathematical relation between the three principal ensembles is also not very clear, for example, is it necessary or just convenient to adopt the grand canonical ensemble for the free Bose and Fermi Gas? For all this the book is well written and compact.

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This is really a second edition of the author's Theory and applications of the Boltzmann equation, published in 1975 in Edinburgh (but not then reviewed in the Gazette). The first 7 chapters are essentially the same, but there is a nine-page appendix detailing more recent developments to this material. The last chapter is new and deals with the use of functional analysis to derive existence and uniqueness theorems and the qualitative behaviour of the solutions of the equation.

The idea behind the Boltzmann equation is quite simple (and might be said to be the only thing about the equation which is). Whereas the equilibrium properties of systems in statistical mechanics can be handled fairly well by means of suitable averages, the much more interesting non-equilibrium properties are still not well understood. In the case of dilute