The relation between the approximate velocity space and the approximate pressure space alluded to on p. 267 also merits a reference. The explanation offered, namely "This is necessary because in (8.5.4)–(8.5.6) the approximation of the first derivatives of u and v and the approximation of P should have the same order", is nonsense. The situation is reasonably well understood by Numerical Analysts but often a mystery to engineering students.

The students may question the explanation on p. 276 of why test functions in the weak formulation of the enthalphy formulation of the Stefan problem suddenly need to depend on both space and time. After all, these test functions were time-independent in previous nonlinear parabolic problems!

Concluding this review, I congratulate Professor White on a fine text, written with clear perspectives which he sticks to throughout. Five years of classroom experience shows! The emphasis on interesting nonlinear problems in particular sets this book apart from the crowd of introductory texts on finite elements. Also, it is a handsome volume with typography that pleases the eye. I recommend it for its intended purpose without hesitation. If, in a next edition, the author elucidates the practical importance of knowing the correct rate of convergence, it may become the best introductory book on finite elements on the market for an engineering or physics audience.

And, for a second ending of my review: I had fun reading this book!

L. B. W.

2[65–01, 65N30].—R. WAIT & A. R. MITCHELL, *Finite Element Analysis and Applications*, Wiley, Chichester, 1985, xii + 260 pp., $23\frac{1}{2}$ cm. Price $35.00.

This is a comprehensive text on finite elements. It is intended for "final year undergraduate or first year postgraduate students in mathematical sciences or engineering". Further, "no specialized mathematical knowledge beyond a familiarity with calculus and elementary differential equations is assumed".

I wish to add to that a general requirement of mathematical maturity: The Introduction breezes through function spaces, Hilbert spaces, linear operators, Riesz' representation theorem, Lax-Milgram's lemma, monotone operators, Sobolev spaces, trace theorems and other standard material in twelve pages. The second chapter covers extrema of integrals, Euler-Lagrange equations, constrained extrema, possibly with boundary conditions, Hamilton's principle, and dual variational principles in fourteen pages.

It is clear that the students referred to above are great students in Britain, not our typical students in a US university.

As already noted, the text is comprehensive, indeed almost encyclopedic. This leads to a lack of clear objectives (other than to "understand finite elements") that I suspect US undergraduate students or engineering graduate students will not be enthusiastic about.

The book succeeds in being comprehensive in 251 pages. It should serve well as a text for a graduate course in Mathematics or for self study for a mathematically mature person really interested in learning the subject. The style is readable.

The applications given in Chapter 7 are, to my mind, disappointing. Except for singular isoparametric elements in corner problems and first-order hyperbolic problems, the rest (seven) of the applications are in one space dimension. This hardly reflects the state of the art, either regarding applications or theory.

It is the privilege of a reviewer to quibble with minor details:

Exercise 1.15 (p. 20) is wrong as stated; rotation by 90° in the plane provides a counterexample.

On p. 23 the authors state: "It will be shown in later chapters that the most natural error bounds are defined in terms of Sobolev norms." Apart from the overall logic of this sentence, I quarrel with the word "natural". Most convenient error measure, yes; a lazy man's error measure, yes; but hardly the most natural error measure in general for a serious Numerical Analyst.

On p. 47 the complete quintic element is dismissed as being "of little practical use and will not be considered further". Fix and Strang in their 1973 book call the C^1 quintic "one of the most interesting and ingenious of all elements" (p. 82). Fashions change, or, should one take statements such as those seriously ...?

The corollary on p. 195, dealing with pointwise error estimates in piecewise linear finite elements for second-order elliptic problems, reproduces a well-known error for the exponent of the logarithmic factor. The examples of "sharpness" quoted are merely suggestive. A true example was constructed by Haverkamp in 1982.

The reference on p. 248 to Dupont's 1973 paper has nothing to do with "an alternative approach to the solution of hyperbolic equations". The article in question contains an extremely interesting counterexample.

In conclusion, this is a well-written and comprehensive text for a first course in finite elements for graduate students in Mathematics, or for self study for someone seriously interested in educating himself on the subject. It starts from scratch and quickly moves up to describe rather recent research.

L. B. W.

3[65–04].—WILLIAM H. PRESS, BRIAN P. FLANNERY, SAUL A. TEUKOLSKY & WILLIAM T. VETTERLING, *Numerical Recipes—The Art of Scientific Computing*, Cambridge Univ. Press, Cambridge, 1986, xx + 818 pp., 24 cm. Price $39.50.

The following quote from the Preface to *Numerical Recipes—The Art of Scientific Computing* (hereafter abbreviated *NR*) should help convey the spirit of the book: "... this book is indeed a 'cookbook' on numerical computation. However there is an important distinction between a cookbook and a restaurant menu. The latter presents choices among complete dishes in each of which the individual flavors are blended and disguised. The former—and this book—reveals the individual ingredients and explains how they are prepared and combined." To extend the analogy a bit, *NR* does not teach one to be a master chef, and it rarely recommends an occasional meal prepared by one.

The Preface claims the reader to need a "normal" undergraduate mathematics background and some computer programming experience, but no prior knowledge of numerical analysis. To indicate the scope of this book, a list of the chapter titles