correspond respectively to: (real) Linear vector spaces, Linear vector spaces with a positive definite scalar product, and Linear vector spaces with a scalar product, not necessarily positive definite. Part I (=Chapter 1) is mainly of an introductory nature. Part II is concerned with geometrical considerations in a linear vector space with a positive definite scalar product. Chapter 2 ends with a section entitled "The key to the hypercircle method," and this is where the present review started. Chapter 3 bears the title: "The Dirichlet problem for a finite domain in the Euclidean plane." Chapter 4 is titled "The torsion problem." Chapter 5 deals with various boundary value problems, for example, the equilibrium of an elastic body. Part III contains two chapters, one on geometry and the other one on vibration problems. Somewhat loosely phrased, the general idea is that the minimum principles of Part II become variational principles in Part III.

The printing and format of the book are excellent. The exposition is of the highest order; many an exquisitely turned phrase is to be found among its pages. There is a wealth of figures and every section ends with a set of exercises for the reader. The author's keen concern for actual numerical results is evident from the many specific examples which he has worked out in detail, using a hand computer. Of special interest in this regard is his clear distinction, at the end of Chapter 2, between reliable and unreliable bounds, relative to the usual methods of numerical computation to so many significant figures. The author's point about "the practical computer (who claims to have *solved* a set of equations, when he has not, strictly speaking)" is very well taken.

J. B. DIAZ

Differentialgeometrie. By E. Kreyszig. Mathematik und ihre Anwendungen in Physik and Technik. Series A, vol. 25. Leipzig, Akademische Verlagsgesellschaft Geest und Portig K. G., 1957, 9+421 pp. DM 36.

This book belongs to the type, represented in English by Eisenhart's *Introduction to differential geometry* (Princeton, 1940), in French by Bouligand's *Principes de l'analyse géométrique* (Paris, 3d ed., 1949) and in German and Čech by Hlavaty's *Differentialgeometrie* (Groningen, 1939), written for those who believe that the standard material of classical differential geometry is best presented within the context of or at any rate together with the tensor calculus. Such students and lecturers will find in the present book a pleasant and unhurried presentation of the elementary theory of curves and surfaces

(Frenet formulae, lines of curvature, Gauss-Bonnet theorem, minimal surfaces, etc.), in which clarity of expression is obtained without that lack of rigor which is sometimes a feature of other texts—even of those written after the thunderbolts of Study's Olympus sent Scheffers reeling back to the shelter of his work room to check up on the formulation of his theorems. The author, who has taught both at Münster in Westfalen and at Ottawa in Ontario, has tried to combine his attempts at careful formulation of results and at introducing the abstractions of the tensor calculus with *Anschaulichkeit*; one of the reasons he has succeeded so well in this visualization is the presence of a considerable number of most excellent illustrations. The reader will also find a number of exercises, with the solutions at the end of the book, carefully explained (and illustrated) in no less than forty pages. A few topics not found in the standard texts (S. Bergmann's conformally invariant metric, the surfaces $W=W(x, y)$ belonging to analytic functions $f(z)=We^{i\phi}$), as well as some historical remarks contribute to the value of this book.

D. J. STRUIK

Matrix calculus. By E. Bodewig. New York, Interscience, 1956. 11+334 pp. $7.50.

This book is of primary importance to the practical computer. Its author has many years' experience in this field.

The principal problem which the computer has in matrix theory is to find the eigenvalues and eigenvectors of a given matrix. If this could be done easily, so could almost all other computational problems. Now no single method for solving this fundamental problem is the "best" one for all matrices. The practical computer is forced to use various methods for various special cases. This book contains a very useful and complete account of many familiar and of several unfamiliar computational devices, with analyses of most of them. The emphasis is usually on hand computation, but by no means exclusively so.

Subjects covered include Linear Equations (including ill-conditioned equations), Inversion of Matrices (including geodetic matrices), Eigenproblems. In all chapters, the author classifies methods as *direct* or *iterative*; the latter are usually more appropriate for mechanization.

The combination of practical and theoretical points of view make this an interesting book. By and large the notation used by the author is entirely appropriate. Although this notation is not used universally in all its details, it is standard enough.

J. L. BRENNER