guarantee against the existence of others. One mildly adverse criticism could be made on account of possible ambiguity in the use of the solidus. For example, in formula (50), p. 93, does $(1/2\pi)$ mean $1/(2\pi)$ or $(1/2)\pi$? Probably the latter, though the fact that "1" is printed at a higher level than "2π" might suggest the former. In (17), p. 31 the use of $\pi\beta^{-1}$ and $(\pi/\beta - ac/\beta)$ in the same formula makes one wonder what the guiding principle in the employment of the solidus should be.

D. V. WIDDER

Vorticity and the thermodynamic state in a gas flow. By C. Truesdell. (Memorial des Sciences Mathématiques, no. CXIX.) 4+53 pp. Paris, Gauthier-Villars, 1952.

In present-day researches on the flow of a gas, the vorticity has come to play an increasingly important role. It is only necessary to cite, for instance, the investigations on the motion of the earth's atmosphere which have stressed more and more the importance of the vertical component of the atmospheric vorticity. In his monograph, Professor Truesdell shows how closely connected is the vorticity with the thermodynamic variables such as the pressure, temperature, entropy, enthalpy, etc., of the gas. Gas flows are divided into two mutually exclusive classes: complex-laminar (Kelvin's complex-lamellar) in which the vorticity and velocity vectors are perpendicular; and Beltrami motions where they are parallel. Irrotational motion is a special case of complex-laminar flow. The properties of these flows are expressed in twenty-six theorems of a general type; for example, it is shown why and under what conditions a gas-flow may be instantaneously barotropic, or isentropic, or such that all the variables of state and the speed are constant upon each stream-line. As an illustration, Theorem 10 may be quoted, viz: "In an inviscid flow in continuous motion as an inert mixture devoid of heat flux, if the extraneous force be zero or normal to the velocity and if the pressure field be steady, then both the entropy and total enthalpy of each particle remain constant." The last ten pages of the text are devoted to "Prim gases" in which the density is a product of a function of the pressure and a function of the specific entropy. The reading of the monograph is much facilitated by the provision of an index of definitions and by an index of symbols.

This work will be an invaluable reference book to those already acquainted with hydrodynamics and gas dynamics. The beginner may however well ask: where in nature or in the laboratory do piezotropic fluids, Beltrami and Hamel flows, Prim gases, etc., occur? Am

I reading a work on pure mathematics or are there physical situations to which these theorems apply, and, if so, what are they? Brief answers to these questions could have been given without unduly lengthening the text and it may be hoped that, in some later edition, this minor defect will be remedied. In the meantime, the expert will be grateful for so clear and condensed a compendium of the thermodynamic properties of a gas in motion.

G. C. McVittie

Höhere Mathematik für Mathematiker, Physiker, Ingenieure. Part VI. *Integration und Reihenentwicklung im Komplexen. Gewöhnliche und partielle Differentialgleichungen.* By R. Rothe and I. Szabó. Stuttgart, Teubner, 1953. 251 pp. 17.60 DM.

This book is a continuation of Rothe's *Höhere Mathematik für Mathematiker, Physiker und Ingenieure.* A further volume is planned dealing with eigenvalue problems and with the calculus of variations.

Contents: I. Functions of a complex variable. Regularity, Cauchy's Theorem, residues, power series, isolated singularities, the Γ-function, asymptotic expansions. II. Linear differential equations. Elementary general theory, solution in power series, classification of singularities, behavior near a singular point, solution by Laplace transforms. III. Special differential equations. Hypergeometric equation, Legendre's equation, Bessel functions, Mathieu functions. IV. Partial differential equations, Cauchy's problem; elliptic, hyperbolic, parabolic. Riemann's method. Separation of variables.

This book is primarily intended for engineers, but its standards of rigor leave nothing to be desired. The presentation is very clear and by careful organization of the material a large amount of information has been condensed into small space without any bad effect on the readability. General theorems are followed by interesting illustrations and well selected (solved) exercises are provided; many of them develop the theory given in the text a little further and give at the same time an idea of the various possible applications, from engineering problems to quantum mechanics. The confluent hypergeometric series and Mathieu functions receive a comparatively detailed treatment, in line with their increasing use in Applied Mathematics. The few pages on partial differential equations give a surprisingly large amount of information, not just the usual collection of particular solutions.

To avoid a review without any adverse comment the reviewer should like to question the feasibility of computing $J_1(1000)$ from Hansen's integral by means of Simpson's formula.

W. H. J. Fuchs