Exercices d'Analyse. By Gaston Julia. Paris, Gauthier-Villars. Vol. 2, 1932, iv+344 pp.; Vol. 3, 1933, iv+287 pp.

These two additional volumes of exercises in analysis continue in the same spirit as that of the first volume which was reviewed by E. Hille in this Bulletin, vol. 35, p. 739. Indeed the method adopted for all three books is the same, namely that of treating (solving) each of a relatively small number of problems in several very distinct ways and of comparing the different methods employed in these solutions. The volumes constitute a set of varied exercises which figure in the programme of certification of the differential and integral calculus at the École Normale Supérieure, the Sorbonne, and other schools. They in no sense replace the material of Goursat's *Cours d'Analyse*, but are, rather, companion volumes designed primarily for those students preparing for the examinations of the *licence* and the *aggrégation*. Some of the exercises are new while others have been taken from past examinations. In volume 2 (analysis), Chapters 2 and 4 and parts of Chapters 1 and 5, being descriptive in character, are more like the standard text-book. The third volume (differential equations) is given over wholly to the 45 problems contained therein.

Most of the problems have at least two solutions, some have as many as four. The results as well as the methods employed are made use of in applications which accompany the solutions; and there are such applications or remarks associated with almost every exercise. The tables of contents themselves number 12 pages and 17 pages, respectively. It would not be feasible, therefore, to consider here and in detail the variety of topics discussed; but the chapter headings of the two volumes will give some indication of the scope of the works. These are, in condensed form: vol. 2, (1) *Analytic functions*, (2) *Development in series*, (3) *Residues*, (4) *Analytic transformations*, (5) *Conformal mapping*; vol. 3, (1) *Methods of integration* (in which are treated integration by quadratures, Riccati's equation, etc.), (2) *Linear equations* (with special reference to singular points, transformations, etc.), (3) *Singular integrals*.

It is evident that the high standards of achievement required of the French student of mathematics can be matched by no such requirements even in the very best of our American universities.

C. O. OAKLEY

Lehrbuch der höheren Mathematik für Universitäten und Technische Hochschulen. By Gerhard Kowalewski. Berlin and Leipzig, Walter de Gruyter, 1933. Vol. I, 208 pp., Vol. II, 240 pp.

These two volumes will be followed by a third; the three volumes were prepared by Professor Kowalewski (Dresden) after nearly thirty years teaching experience. Beginning with analytic geometry he develops a wide variety of mathematical topics following an order of arrangement and methods of presentation which are not customary to American texts. In the first volume, *Vektorrechnung und Analytische Geometrie*, after defining vectors, vector operations, and vector properties, he uses vector notions to develop the theory and use of homogeneous coordinates for the points of a plane and of a line, the transformation of coordinates, principal properties of determinants, some geometric properties of triangles and quadrilaterals, homogeneous and non-

homogeneous systems of linear equations, and anharmonic ratio. After some applications to spherical trigonometry and to statics he discusses without using vectors the following topics in the order named: rotation in the plane, coaxial quaternions and ordinary complex numbers, spirals, linear fractional transformations, reflection on a circle and on a line, fundamental geometric forms of the first kind and projective relations between them, involutions on one-dimensional forms, Pascal's theorem, projectivities between planes, projective generation of conics, etc.

The second volume has two divisions. In the first, *Hauptpunkte der Analytischen Geometrie des Raumes*, the projective properties of ordinary space and of quadric surfaces are treated; in the second part, *Grundbegriffe der Differential- und Integralrechnung*, rigorous treatments are given of convergent sequences, limiting values, the operation of passing to a limit, and the derivative and differential of a function. After computing the derivatives of some elementary functions, he studies the Leibnitz fundamental theorem, namely, $dF(u) = F'(u)du$, where $u = f(x)$, then the mean value theorem, and closes with the use of integration to determine areas of plane surfaces and lengths of curves.

Since the book is designed for *Hochschulen* as well as for *Universitäten* the reviewer assumes that the student would have no previous knowledge of the subjects treated and believes that these books alone would not give an adequate knowledge of analytic geometry or of projective geometry or of the calculus, though they might be used to advantage to supplement texts which are more elementary and at the same time more complete, or to follow a first and more complete treatment of the subjects enumerated. There are few examples and no exercises for the student, nor is there a prefatory word from the author to give a clue either as to the mathematical maturity of the students for whom his books are intended or as to the length of time he would expect them to spend on this amount of material.

MAYME I. LOGSDON

Krise und Neuaufbau in den exakten Wissenschaften. Fünf Wiener Vorträge. Leipzig and Wien, Deuticke, 1933. iv+123 pp.

This volume consists of five general addresses on the present state of physics, with authors and titles (in translation) as follows:

Hermann Mark: The shock of classical physics due to experiment.
Hans Thirring: The transformation of the system of concepts of physics.
Hans Hahn: The crisis in outlook (Anschauung).
Georg Nöbeling: The fourth dimension and curved space.
Karl Menger: The new logic.

R. D. CARMICHAEL