the subject matter. Solutions of more difficult exercises are given or indicated in the text.

HING TONG

Integration in finite terms. By J. F. Ritt. New York, Columbia University Press, 1948. 7+100 pp. $2.50.

Advances in mathematical analysis have been intimately bound to the development of the notion of function. It was only in the last century that, both in the real and complex domain, the function concept was explicitly and completely elaborated. With this achievement it was possible to place on a sound foundation the calculus of earlier times. Having progressed so far, certain questions concerning the properties of functions of classical analysis lost their logical import. But their historical significance remains untarnished as generation after generation of young mathematicians is trained through the medium of the calculus.

The functions of classical analysis are the elementary functions: that is, those which can be constructed from the variables $x, y, \cdots$ by a finite number of algebraic operations and the taking of logarithms and exponentials. For example, $\cos y^{1/2}+\log [x^3+\arctan (x \log y)]$ is elementary. The young student quickly discovers that the closure of this set of functions under the operations of analysis is not an obvious fact, if it be a fact at all. Indeed, his instructor assures him that certain functions cannot be integrated in finite terms, that is, their integrals cannot be given an elementary representation. One hazards the guess that in a substantial number of the good courses in calculus offered in this and other countries, this is the one subject about which the instructor may not have first-hand knowledge. Rather, he imparts to his young charges, frequently with embarrassment, information which is based on hearsay.

Professor Ritt has now written a short book in which the reader will find all the material on this subject which should be the property of the complete mathematician. The theory exposed is one of considerable charm and of classical importance. A method is developed which may be used in attempting the solution of arbitrary problems on the representation of functions in an elementary manner. This method is then applied to certain specific questions where it yields complete results. It does not provide easy answers to the great variety of questions which one could propose. In spite of this fact, it possesses a certain degree of finality. It is truly extraordinary that no book has been written previously on this subject except in Russian.[1]

[1] The book by G. H. Hardy, *The integration of functions of a single variable*, Cambridge Tracts, 1905, is not one in which the Liouville theory is expounded. The author