Introduction to measure and integration. By M. E. Munroe. Cambridge, Addison-Wesley, 1953. 10+310 pp. $7.50.

In the last years, in particular since Halmos' book on measure theory, modern theory of integration has become a regular part of the mathematics curriculum. Munroe's book is one of the first designed specifically for students. It begins with the basic concepts of real function theory and covers the by now classical part of measure theory. The organization is logical in the sense that measure, measurability, integration, and differentiation are studied in that order. The exercises are selected so as to make the text better understood as well as to suggest further study. The presentation is clear and concise.

Chapter I introduces the concepts in use throughout the book: algebra of sets, additive classes, metric spaces, limits and continuity. Chapters II and III are devoted to the investigation of measures: construction and particular types. Beginning with properties of additive set functions and their Jordan decomposition, the author procedes to the construction of measures by means of outer, then metric outer, measures. Lebesgue-Stieltjes, Hausdorff, and Haar measures are considered in some detail. Measurable functions are introduced in Chapter IV. Operations on and approximations of these functions are carefully presented. Chapter V is devoted to integration. The definition of integrals begins with that of integrals of simple functions, then of non-negative measurable functions. The study of indefinite integrals leads to the Radon-Nikodým theorem. The Fubini theorem closes the chapter. Chapter VI, entitled convergence theorems, starts with the study of various types of convergence of measurable functions, and continues with that of L_p spaces, linear functionals on Banach spaces, orthogonal expansions in Hilbert spaces, and the mean ergodic theorem. The final Chapter VII on differentiation covers differentiation of additive set functions in euclidean spaces, metric density, and differentiation with respect to nets. The book contains also a few general concepts of probability theory.

There is no doubt that the author did a remarkable job in about three hundred pages. Yet, it seems to the reviewer that for students who are introduced for the first time to measure theory, the presentation is too abstract, too fast, and too soon. The reviewer's own teaching experience and bias would lead him to a somewhat different order of presentation. He would start with the algebra of sets and Borel sets and proceed at once to measurable functions, integration, and convergence theorems. Construction of measures and metric spaces would follow. The reviewer feels that the basic property—to be emphasized—of the family of measurable functions is its closure under the "usual" operations of analysis. The student is familiar with continuous functions and with the difficulties due to the fact that limits of convergent sequences of such functions are not necessarily continuous. It is thus easy to make him understand the importance and value of the closure property. Furthermore, it seems useful to avoid the possibility of the student's acquiring the misleading idea that the measurability concept is based on the measure concept, and also to point out that these two concepts are related only through the background of completely additive classes. However, the main reason for the suggested approach is didactic. This approach requires a few concepts only, hence it is easier to digest for the student who is not overburdened with new concepts. Also, since convergence theorems are basic in the modern theory of integration and in its use, it seems preferable to get to them as fast as possible and not to have to cover the first 220 pages. Construction of measures and study of metric spaces, which are far more abstract and involved, would come later.

Stripped of the concepts and details unnecessary to the approach outlined above, the part of the book relative to measurability, integration, and convergence theorems would make an excellent text for a one-semester course, possibly an undergraduate one. The foregoing remarks reflect mainly the fact that this well-written and well-rounded book may be used successfully in various ways.

M. Loève

Contributions to the theory of games. Vol. 2. Ed. by H. W. Kuhn and A. W. Tucker. (Annals of Mathematics Studies, no. 28.) Princeton University Press, 1953. 396 pp. $4.00.

This collection of various papers on the theory of games is the second such volume edited by Professors Kuhn and Tucker to form an Annals of Mathematics Study. The merit of this form of publication seems to the reviewer to be considerable, because the great extent and development of mathematics make a volume dedicated to a specialized topic an efficient way to reach specialists. A good many of the twenty-one papers in the volume are good and indicate that the subject has not yet lost its vitality or momentum.

The first section of the volume contains five papers on finite zero-sum two-person (z-s t-p) games. Paper no. 1, by v. Neumann, discusses the optimal assignment problem, i.e., the assignment of n persons to n jobs so as to maximize the value of the assignment. He shows that the problem is equivalent to solving a z-s t-p game which is simpler computationally than the original assignment problem. Paper no. 2 by Gillies, Mayberry, and v. Neumann, discusses two