

ABSTRACTS OF PAPERS

SUBMITTED FOR PRESENTATION TO THIS SOCIETY

The following papers have been submitted to the Secretary and the Associate Secretaries of the Society for presentation at meetings of the Society. They are numbered serially throughout this volume. Cross-references to them in the reports of the meetings will give the number of this volume, the number of this issue, and the serial number of the abstract.

159. Dr. O. K. Bower: *Applications of an abstract existence theorem to both differential and difference equations.*

A functional equation of the form $f = g + Sf$, in which g is a known function and S a suitable functional operator, has for some time been used to prove existence theorems for integral and differential equations (Max Mason, *Selected topics in the theory of boundary value problems of differential equations*, The New Haven Mathematical Colloquium, 1906, p. 173). This paper considers an equation of this form with modified restrictions on the function g and operator S and proves an abstract existence theorem which can be applied directly to proving the existence of solutions of integral, finite integral, q -integral, differential, difference, and q -difference equations having relatively simple solutions in the neighborhood of infinity. The principal novelty of this treatment lies in making all of the six cases depend on a single abstract theorem, which is possible because of the inherent similarities in the operations of differentiating, differencing, and q -differencing. (Received May 11, 1932.)

160. Dr. O. K. Bower and Mr. J. D. Grant: *A system of simultaneous bilinear functional equations.*

This paper considers the system of simultaneous bilinear functional equations $S: u_j(x+y) = \sum_{i=1}^j a_{i, n+j+1-i} u_i(x) u_{n+j+1-i}(y)$, $j=1, 2, \dots, n$; $a_{i, n+j+1-i} = a_{i, j+1-i}$, $u_{n+j+1-i} = u_{j+1-i}$, $i \leq j$, in which the constant coefficients $a_{i, n+j+1-i}$ are such that there is a solution consisting of n linearly independent and continuous functions. This system of equations is a generalization of the cosine and sine, hyperbolic cosine and hyperbolic sine addition formulas ($n=2$), and has likewise as a special case when $n=3$ the functions u_1, u_2, u_3 discussed by Mr. L. E. Ward (*American Mathematical Monthly*, vol. 34 (1927)). It is shown that there are as many "normal" forms for S for each value of n as the number of divisors of n , unity and n included, and that the number of entirely arbitrary constants in the general solution of each of these forms is equal to n . (Received May 11, 1932.)

161. Professor Alonzo Church: *A set of postulates for the foundation of logic.* Second Paper.

In a recent paper (*Annals of Mathematics*, vol. 33 (1932), pp. 346-366) the author proposed a set of postulates for logic, which, it was hoped, would avoid