

ABSTRACTS OF PAPERS

SUBMITTED FOR PRESENTATION TO THE 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.

ALGEBRA

178. Reinhold Baer: *A theory of crossed characters.*

If G is a finite group, C a homomorphism of G into the group of automorphisms of the cyclic group E , then a C -character of G is any single valued G to E function $f(x)$ satisfying the functional equation: $f(uv) = f(u)f(v)$ for u, v in G where the exponent v indicates the automorphism upon which the element v is mapped by C . The C -characters of G form a finite abelian group; and it is the object of a theory of crossed characters to find conditions assuring the possibility of establishing a partial or complete duality between G and its C -character group. (Received April 23, 1943.)

179. Reinhold Baer: *Radical extensions and crossed characters.*

An m -extension of the field F is a finite, normal and separable extension of F which is obtained by adjoining to F m th roots of elements in F . A theory of these extensions may be obtained by applying the theory of crossed characters on the Galois group of these extensions. (Received April 23, 1943.)

180. C. J. Everett: *Closure operators and galois theory in lattices.*

Every $*$ -closure ($A^* \supseteq A$; $A \subseteq B$ implies $A^* \subseteq B^*$) on a partially ordered set arises from a galois correspondence between P and some partially ordered set Q . Every galois correspondence between complete lattices of subsets of two sets results from a binary relation on all elements of the two sets. Every closure on a complete lattice P of subsets of a set is extensible to all subsets; if $(A \cup B)^* = A^* \cup B^*$ in P , the extension is also topological, for P a boolean algebra. Every closure on all subsets of a set is defined by a binary relation. A generalization of Krull's topology for algebraic fields is obtained and used to characterize the regularly closed subspaces of the linear functional space of a Banach space. Necessary and sufficient conditions are given for the existence of a topology in a group on whose subgroup lattice a $*$ -closure is defined, such that a subgroup is $*$ -closed if and only if it is closed in the topology. This is combined with results of Baer on primary groups to characterize topologically the subgroups closed under the galois correspondence between P and its automorphism group, A . Krull's method converts A into a metric, totally disconnected, topological group. (Received May 29, 1943.)

181. Irving Kaplansky: *Solution of the "problème des ménages."*

The "problème des ménages" asks for the number of ways of seating n husbands and n wives at a circular table, men alternating with women, so that no husband

sits next to his wife. By elementary methods, the author obtains the answer $4n n! \sum_{k=1}^n (-1)^k C_k^{2n-k} (n-k)! / (2n-k)$. (Received June 1, 1943.)

ANALYSIS

182. E. F. Beckenbach and R. H. Bing: *Conformal minimal varieties.*

A set of m real functions of n real variables, $m \geq n \geq 2$, defined in a domain D , has been called (for $m = n$ by N. Cioranescu, Bull. Sci. Math. vol. 56 (1932) pp. 55-64) a set of conjugate harmonic functions provided the functions are harmonic and together satisfy the usual conditions for conformality. Such a set of m functions gives a conformal map on Euclidean n -space of a minimal variety V_n immersed in Euclidean m -space. But according to Haantjes, for $n \geq 4$ the class of conformally flat spaces is quite narrow. It is now shown directly that for $n \geq 3$ the only sets of conjugate harmonic functions necessarily are constants or linear functions, so that either the V_n is a point or it can be obtained from D by rigid motions, transformations of similitude, and reflections in hyperplanes. (Received May 7, 1943.)

183. R. P. Boas: *Almost periodic functions of exponential type.*

As an extension of a well known result on entire functions of exponential type which are periodic on the real axis, it is shown that an entire function of exponential type which is almost periodic on the real axis has its Fourier exponents bounded. Almost periodicity as general as Besicovitch (order 1) is admissible; in fact, the mere existence of the mean value of $|f(x)|$ implies the existence and vanishing of the mean value of $f(x)e^{i\lambda x}$ when $|\lambda|$ exceeds the type of the function $f(z)$. For the proof, one rotates the line of integration in $\int_0^x e^{i\lambda z} f(z) dz$ through an angle of $\pi/2$, and applies theorems which connect the growth of $|f(x+iy)|$ with that of $|f(x)|$. The estimate $f(x) = o(|x|)$ as $|x| \rightarrow \infty$ is a consequence of the existence of the mean value of $|f(x)|$. (Received May 11, 1943.)

184. Vincent Cowling and Walter Leighton: *On convergence regions for continued fractions.*

Let k be any real number greater than 1 and ϵ any number such that $0 < \epsilon < k$. If the complex numbers a_{2n} and $a_{2n+1} = r_n e^{i\theta_n}$ satisfy the conditions (1) $|a_{2n}| \leq k - \epsilon$, $a_{2n} \neq -1$, (2) $r_n \geq 2[k - \cos \theta_n]$, $0 \leq \theta_n \leq 2\pi$, then the continued fraction $1 + K[a_n/1]$ converges. It follows as a corollary that the continued fraction will converge if conditions (1) and $|a_{2n+1}| \geq 2(k+1)$ hold. (Received April 28, 1943.)

185. Nelson Dunford: *Spectral theory. I. Convergence to projections.*

By a systematic use of an operational calculus suggested by the formula $f(T) = (2\pi i)^{-1} \int_C f(\lambda) (\lambda I - T)^{-1} d\lambda$ conditions are derived which are necessary and sufficient for the convergence of a given sequence $P_n(T)$ of polynomials in a linear operator T (on a complex Banach space X) to a projection on a manifold of the form $M[P] = E_x[x \in X, P(T)x = 0]$. (Received April 24, 1943.)

186. M. R. Hestenes: *On the condition of Weierstrass in the calculus of variations.*

The present paper is devoted to the study of properties of the Weierstrass E -func-