ABSTRACTS OF PAPERS

The abstracts below are abstracts of papers presented by title at the Fifty-Fifth Summer Meeting of the American Mathematical Society. Abstracts of papers presented in person at that meeting will be included in the report of the meeting which will be published in the November issue of this BULLETIN.

Abstracts are numbered serially throughout this volume.

ALGEBRA AND THEORY OF NUMBERS

445. W. V. Parker: *On matrices whose characteristic equations are identical.*

Two generalizations of an earlier theorem (Bull. Amer. Math. Soc. vol. 55 (1949) p. 115) are given. (1) Let A be an $n\times m$ matrix of rank $r<n$ and let C be an $m\times n$ matrix such that $ACA=kA$ (k a scalar). If B is an $m\times n$ matrix, the characteristic equation of AB is $x^{n-r}\phi(x)=0$ and the characteristic equation of $A(B+C)$ is $x^{n-r}\phi(x-k)=0$. (2) If M and N are square matrices such that MN (or NM) $=N^2=0$, then M and $M+N$ have the same characteristic equation. (Received July 5, 1949.)

446. H. J. Ryser: *A note on a combinatorial problem.*

Let v elements be arranged into v sets such that each set contains exactly k distinct elements and such that every pair of distinct sets has exactly λ elements in common ($0<\lambda<k<v$). It is shown that these hypotheses imply that $\lambda=k(k-1)/(v-1)$. It then follows readily that in the given arrangement each element must occur exactly k times and every pair of elements must occur exactly λ times. For further results concerning the above combinatorial problem see the recent abstracts of Chowla and Ryser entitled *Combinatorial problems* I and II. (Received June 12, 1949.)

ANALYSIS

447. Garrett Birkhoff: *Group theory and differential equations.*

Let an nth order system of ordinary differential equations Γ be invariant under a solvable Lie group having m-dimensional sets of transitivity. Then the integration of Γ can be reduced to the integration of an $(n-m)$th order system, and quadratures. (Received May 5, 1949.)

448. S. H. Chang: *A generalization of a theorem of Hille and Tamarkin with applications.*

Hille and Tamarkin (Acta Math. vol. 57 (1931) pp. 1–75, p. 46) proved that if $\partial^\rho K(x, y)/\partial x^\rho = K^{(\rho)}(x, y)$ ($\rho=1, 2, \cdots, s-2$) be continuous and $K^{(s-1)}(x, y) = \int_a^x g(t, y)dt + c(y)$ where $g(x, y)\subset L^2$, so that $\|g(x, y)\|^2=\int_a^b\int_a^b |g(x, y)|^2 dxdy<+\infty$, then the set of characteristic values $\{\mu_h\}$ of $K(x, y)$ satisfies $1/|\mu_h| = o(h^{-s-1/2})$. In this paper the author proves that under the same hypothesis, we also have $1/|\lambda_h| = o(h^{-s-1/2})$, where $\{\lambda_h\}$ denotes the set of singular values of $K(x, y)$, that is, E. Schmidt's characteristic values of unsymmetric kernels. From this result, the author