THE NOVEMBER MEETING IN UNIVERSITY, ALABAMA

The five hundred and seventh meeting of the American Mathematical Society was held at the University of Alabama in University, Alabama on Friday and Saturday, November 26–27, 1954. About 130 persons registered, including 99 members of the Society.

By invitation of the Committee to Select Hour Speakers for Southeastern Sectional Meetings, Professor Nathan Jacobson of Yale University addressed the Society Friday evening on the subject *Division rings*, with Professor Alfred Brauer presiding.

Sessions for contributed papers were held Friday afternoon and Saturday morning, Professors A. S. Householder, G. B. Huff, Wallace Givens, A. D. Wallace, and F. A. Lewis presiding.

Abstracts of the papers presented follow. Those having the letter "*t*" after their numbers were read by title. Where a paper has more than one author, that author whose name is followed by "(p)" presented it. Professor González was introduced by Professor F. A. Lewis, Dr. Swift by Professor J. H. Roberts, and Mr. Stallard by Professor W. M. Whyburn.

ALGEBRA AND THEORY OF NUMBERS

72. A. T. Brauer: *Limits for the characteristic roots of a matrix.* VII.

Some of the results of the former parts of this paper [I, Duke Math. J. vol. 13 (1946) pp. 387–395; II, ibid. vol. 14 (1947) pp. 21–26; III, ibid. vol. 15 (1948) pp. 871–877; IV, ibid. vol. 19 (1952) pp. 75–91; V, ibid. vol. 19 (1952) pp. 553–562; VI, ibid. vol. 22 (1954) to be published] will be improved further by obtaining bounds for the components of the characteristic vectors. Let $A=(a_{\kappa\lambda})$ be an arbitrary matrix, ω a characteristic root, $\mathfrak{X}=(x_1, x_2, \cdots, x_n)$ a characteristic vector belonging to ω, and x_r the absolute greatest component. Then ω lies in the circle C_r with center at a_{rr} and radius $P_r=\sum_{\lambda\neq n}|a_{r\lambda}|$. Let R be a closed subregion of C_r containing ω and d_κ be the minimum distance of $a_{\kappa\kappa}$ from R. Set $t_{r\kappa}=1$ if $d_\kappa=0$, and otherwise $t_{r\kappa}=\min(1, P_\kappa/d_\kappa)$ for $\kappa=1, 2, \cdots, n$; $\kappa\neq r$. It is shown that $|x_\kappa|\leqq t_{r\kappa}|x_r|$, and this result is improved by iteration. It follows that ω lies in the circle $|z-a_{rr}|\leqq\sum_{\lambda\neq n}|a_{r\lambda}|t_{r\lambda}$ contained in C_r. Moreover, if the inequalities for the x_κ contradict the rth of the corresponding linear equations, then ω does not lie in R. If A is non-negative, ω the greatest positive root, and x_m the smallest component, then lower bounds for x_κ/x_m are obtained. Using these results it is often easy to compute ω as exactly as wanted. (Received October 13, 1954.)

73. C. C. Buck: *The algebraic aspect of integration in space.*

By "integration in space" is meant the n-dimensional analogue of the notions of integration along a curve, integration over a surface, etc. The term "algebraic" indicates that the discussion is restricted to topics that can be studied without the use of a limit process. An algebraic definition for space integrals has been improvised from a