

THE FIFTEENTH REGULAR MEETING OF THE
SOUTHWESTERN SECTION

The fifteenth regular meeting of the Southwestern Section of this Society was held at the University of Kansas on Saturday, December 2, 1922. The total attendance was twenty-eight, including the following sixteen members:

Ashton, Black, Candy, Garrett, Ingold, Kendall, Lefschetz, J. V. McKelvey, U. G. Mitchell, R. L. Moore, Roever, Edwin R. Smith, G. W. Smith, Stouffer, J. S. Turner, Wheeler.

Professor Ashton occupied the chair, being relieved during the afternoon session by Professor Lefschetz. The morning session and part of the afternoon session were devoted to the reading of the papers listed below. During the afternoon session Professor R. L. Moore gave a special lecture by invitation on *Continuous curves from the view-point of analysis situs*. This paper will appear in full in a later number of this BULLETIN. It was voted to hold the next meeting of the Southwestern Section at the University of Missouri. The following program committee was elected: Professors Hedrick (chairman), McKelvey, and Stouffer (secretary).

The titles and abstracts of the papers read follow below.

1. Professor A. L. Candy: *Cyclic operations on determinants*.

This paper consists chiefly of three theorems: (I) If the rows of a given determinant Δ be added cyclically s in a set, the resulting determinant Δ_s will be equal to zero, or $s \cdot \Delta$, according as n (order of Δ) and s are commensurable, or incommensurable. (II) If the elements in each column of a determinant Δ be permuted cyclically in all possible ways, and the n^n determinants thus formed be collected into groups such that each determinant in the group shall have the same subscripts in the first row, the sum of the determinants in any one of these groups will be equal to $\pm \lambda \Delta$, or zero, according as the weight of the group (the sum of the subscripts in any first row) is, or is not, a multiple of n , where λ is 1, n , a sub-multiple of n , or the sum of two or more such numbers. (III) The sum of the $n!$ determinants that can be formed by making the $n!$ permutations of the columns of a circulant is equal to zero.

2. Professors Claribel Kendall and G. W. Smith: *On the conditions for associativity in linear algebra*.