APRIL MEETING OF THE MISSOURI SECTION

The annual meeting of the Missouri Section of the Mathematical Association of America was held at the University of Kansas City, Kansas City, Missouri, on April 23, 1948. Professor P. R. Rider presided.

About sixty persons were in attendance, including the following twenty-eight members of the Association: L. M. Blumenthal, C. H. Brown, C. B. Burcham, L. H. Cutting, C. E. Denny, W. C. Doyle, D. H. Erkiletian, Jr., G. M. Ewing, D. G. Ewy, C. A. Johnson, L. O. Jones, J. C. Koken, Sister M. Pachomia Lackay, L. E. Laird, Walter Leighton, C. W. Mathews, E. F. Moore, S. T. Parker, A. D. Pierson, G. B. Price, R. M. Rankin, P. R. Rider, J. S. Rosen, R. G. Sanger, G. W. Smith, R. G. Smith, C. B. Tucker, G. B. Van Schaack.

The University of Kansas City was host at a luncheon, at which Dean Norman Royall welcomed those present.

The following officers were elected for the coming year: Chairman, P. R.

Rider, Washington University; Vice-Chairman, W. C. Doyle, Rockhurst College; Secretary, C. W. Mathews, Washington University.

The program was arranged by Professor J. S. Rosen of the University of Kansas City. The following papers were presented:

1. *Almost periodic functions*, by Mr. Asger Aaboe, Washington University, introduced by Professor Walter Leighton.

The theory of almost periodic functions of a real variable, created by Harold Bohr, is briefly outlined.

2. *Convergence regions for continued fractions*, by Professor W. J. Thron, Washington University, introduced by Dr. C. W. Mathews.

The historical development of the subject is outlined. This includes the contributions of Worpitzky, A. Pringsheim, H. B. Van Vleck, H. S. Wall, W. Leighton, and the author. The second part of the paper consists of a brief discussion of the principal methods of proof used.

3. *The definition of the Dirac δ-function*, by Professor G. M. Ewing, University of Missouri.

The so-called Dirac δ-function not only appears in the literature as far back as Kirchhoff, but is introduced in many recent books, usually with an apology, followed by the statement that nevertheless valid results are obtained by following the stated conventions. The present paper introduces a certain class K of functions $\delta_\epsilon(t)$, and points out that the limits of a number of integrals involving δ_ϵ provide interpretations for familiar statements about the δ-function. Such results are independent of the choice of δ_ϵ in K. Linear differential equations $F(D)x=\delta_\epsilon(t)$ are also considered.

4. *The exponential function in applied science*, by Professor Herman Betz, University of Missouri, introduced by Professor L. M. Blumenthal.

The assumptions usually made in describing certain theorems occurring in the natural sciences by means of the exponential function can be considerably relaxed. This paper indicates how this may be done, even in undergraduate courses.

5. *Rational right triangles*, by S. G. Campbell, University of Kansas City, introduced by Professor J. S. Rosen.

The speaker discussed the problem of finding a method of obtaining a series of primitive rational right triangles, the ratios of whose sides are increasingly close approximations to the ratios of the sides of any given irrational right triangle. The method used involves use of a theorem by Euler for expressing the roots of a quadratic equation in terms of a continued fraction. He also dealt with the problem of finding a general method of locating the series of all primitive rational right triangles with a given relation between the sides (as a given difference between any two sides.) The method developed uses a series (recurrent) with scale which is also satisfied by consecutive coefficients generated by a particular rational fraction.

6. *A theorem on determinants*, by Professor G. B. Price, University of Kansas.

This paper contains a simple proof of the following theorem and some of its generalizations: If (a_{ik}), $i, k=1, 2, \cdots, n$, is any matrix of complex numbers such that

$$|a_{ii}| > \sum_{k\neq i} |a_{ik}|, \qquad i = 1, 2, \cdots, n$$

then the determinant $|a_{ik}| \neq 0$. This theorem has been rediscovered repeatedly ever since Levy published the first proof of it in 1881—two first discoveries are reviewed in the 1947 volume of *Mathematical Reviews*. The theorem is one of considerable importance in both pure and applied mathematics, and its history emphasizes the need for a better dissemination of known results.

7. *The importance of computational technique in applied mathematics*, by Y. L. Luke, Midwest Research Institute, Kansas City, Missouri, introduced by Professor J. S. Rosen.

The complexity of many problems in applied mathematics makes important the need for computational technique. Some examples met in actual practice are given. The need for courses in applied mathematics in the undergradutate school is emphasized.

8. *A new trigonometric shifting theorem*, by Professor Eugene Stephens, Washington University, introduced by Professor P. R. Rider.

We may shift sin ax, cos ax, sinh ax, cosh ax across a linear differential operator of the form $F(D)=\sum a_nD^n$ in the following manner:

(A) $$F(D)\cdot\sin ax \equiv \sin ax\cdot F(D+aC),\qquad C\equiv\cot ax$$

(B) $$F(D)\cdot\cos ax \equiv \cos ax\cdot F(D-aT),\qquad T\equiv\tan ax$$

(C) $$F(D)\cdot\sinh ax \equiv \sinh ax\cdot F(D+aC_h),\qquad C_h\equiv\coth ax$$

(D) $$F(D)\cdot\cosh ax \equiv \cosh ax\cdot F(D+aT_h),\qquad T_h\equiv\tanh ax$$

If in the right hand side of these operator identities there appears anywhere C^2, T^2, C_h^2, T_h^2, each can be replaced by -1. These are considered as constants and as commutative with the operator D. The resulting operations on a given subject are simplified by the elementary operational theorems. In the final results the C, T, C_h, T_h are replaced by their respective trigonometric forms.

9. *The real representation of imaginary loci*, by L. E. Laird, Kansas State Teachers College.

This paper presents a method of representation of the pairs of complex numbers (complex points) which satisfy an equation $w=f(z)$, where $w=u+iv$ and $z=x+iy$. The method sets up a one-to-one correspondence between the complex points and real lines in space by use of Plucker's line coordinates. If a functional relationship is assumed between x and y, a single infinity of real lines is determined which constitute a ruled surface.

10. *The convergence in probabilities of statistical sequences*, by Dr. Maria Castellani, University of Kansas City, introduced by Professor J. S. Rosen.

The theory of fitting a curve to a given statistical sequence of data may be considered as a special type of convergence in probabilities. The purpose of the paper is to show how the several definitions of convergence may suit the statistical data, and how results obtained may be tested. The continuity in probabilities of statistical sequences is also considered with special regard to the case in which the sequence converges to a parabola or to a sinusoid.

11. *Mathematics placement tests at the University of Kansas*, by Professor G. W. Smith, University of Kansas.

Professor Smith points out the need for some kind of a placement test in mathematics, and explains the plan used at the University of Kansas. He points out that in September 1946 about twenty per cent of the entering freshmen were affected by the test. The classes were made more nearly uniform, and the college algebra course was strengthened.

12. *Preparation for college mathematics*, by Professor W. C. Doyle, Rockhurst College.

Professor Doyle conducted a panel discussion on ways and means to encourage high schools to strengthen their mathematics programs. It was remarked that colleges should better coordinate what they expect of freshmen, and make better use of placement tests.

P. R. RIDER, *Secretary*