THE APRIL MEETING OF THE IOWA SECTION

The 53rd regular meeting of the Iowa Section of the Mathematical Association of America was held at the Central College, Pella, on April 15, 1966. Chairman Robert V. Hogg presided. Total attendance was 105, including 56 members of the Association. Routine business was considered during the afternoon meeting.

A treasurer's report was given and a balance of $264.32 was indicated.

The following officers were elected:

Chairman, William L. Waltmann, Wartburg College, Waverly

Vice-Chairman, Rev. John L. Friedell, Loras College, Dubuque

Secretary-Treasurer, Earle L. Canfield, Drake University, Des Moines

Vice-Secretary-Treasurer, Basil E. Gillam, Drake University, Des Moines

The following papers completed the program:

Friday morning, April 15, 1966, 8:40-10:50

Quasi-algebraic functions, by Edward S. Allen, Iowa State University.

Antonio Salmeri denotes as "quasi-algebraic" those functions of x and $[x]$ which are algebraic in x. (Gior. di Mat., vol. 91, 1963). Those functions described by him, and those considered in this report, are algebraic in $[x]$ also.

Solutions of linear equations are first considered.

If x is real and positive, and $\{x^n\}$ is the sum of powers of positive terms, $x^n + (x-1)^n + (x-2)^n + \cdots$, it is a quasi-algebraic function. If, in this function, $[x]$ is replaced be x, we obtain the associated function $*\{x\}$. The two functions and their difference are studied in some detail.

The paper then considers the possibility of replacing the real number x by the complex number x + yi.

On order convergence in partially ordered sets, by R. F. Anderson, Iowa State University, introduced by the Chairman.

The relationship studied was between a type of order convergence introduced by Birkhoff [1] and refined by Rennie [3] and a type introduced by Mc Shane [2]. The relationship between them has never been clearly established in the literature. We have given an example to show they are not equivalent and given sufficient condition under which they are. Also, we have formulated Mc Shane convergence in the terms of filters to carry on the work by Vukovic [4].

[1] G. Birkhoff, Lattic Theory, Amer. Math. Soc. Collguium Publications, Vol. 25, 1948.

[2] E. J. Mc Shane, Order preserving maps and integration processed, Annuals of Mathematical Studies, Vol. 31, Princeton, 1953.

[3] B. C. Rennie, Lattices, London Mathematical Society Proceedings, Ser 2, 52: 386-400, 1948.

[4] P. M. Vukovic, Convergence in partially ordered sets, (Master's dissertation, Iowa State University, 1965.)

Generalized derivatives and integrals, by Daniel L. Hansen, Westmar College, Le Mars.

This research was done while at the Illinois Institute of Technology in Chicago, Illinois, during the summer of 1965 as a participant in an NSF Research Participation Program for College Mathematics Teachers. Definitions of a generalized derivative have been given in the following three papers: K. Menger, the Monthly, October, 1957, pp. 58-70; K. Menger and S. Shü, Proceedings of the National Academy of Sciences, 1955, pp. 591-595; G. Pall, the Monthly, October, 1957, pp. 71-78. It is shown that the given definitions are equivalent. A definition is given for a generalized integral (using Pall's notation). Various analogs of integration theorems from complex analysis are then explored.

Approximation of real continuous functions on the real line by infinitely differentiable functions, by Lyle E. Pursell, Grinnell College, Grinnell.

Most extensions of the Weierstrass Approximation Theorem apply only to bounded functions (See: M. H. Stone, "A Generalized Weierstrass Approximation Theorem", <u>Studies in Mathematics</u>, vol. 1, Math. Assoc. of Amer. 1962). It is shown here that any real continuous function on the real line R can be uniformly approximated on R by infinitely differentiable functions. It follows that if the set $C^{\infty}(R)$ of all real infinitely differentiable functions on R is considered as an "extended ($0 \leq$ distance $\leq \infty$) metric space" with the metric $d(f,g) = \sup |f-g|$ then the completion of $C^{\infty}(R)$ via Cauchy sequences may be identified with the space $C(R)$ of all real continuous functions on R.

Panel Discussion. <u>A general curriculum in mathematics for colleges (1965 CUPM report)</u>. Marion Cornwall, Marshalltown Community College, Marshalltown; J. C. Mathews, Iowa State University, Ames; E. R. Mullins, Jr., Grinnell College, Grinnell.

Afternoon Session

1:30-3:30 p.m.

<u>Cell pairs of codimension 2</u>, by T. M. Price, University of Iowa, Iowa City.

Let D^k represent the unit k-cell in E^k and let $n \geq 6$. This paper describes an example of a locally flat cell pair (D^n, X) where X D^{n-2} ($BdX \subseteq BdD^n$ and $intX \subseteq intD^n$) $\pi_1(D^n - X) = Z$ and $\pi_1(BdD^n - BdX) \neq Z$. This leads one to believe that the homotopy groups of $D^n - X$ are not enough to decide whether or not X is unknotted in D^n. Unfortunately the higher homotopy groups of $D^n - X$ are not known as of yet.

<u>Chains of different dimensional topologies</u>, by Bruce A. Anderson, University of Iowa, Iowa City.

If X is a set with cardinal at least c, there is a sequence T_0, T_1,

... of complete metric topologies on X such that for each non-negative integer i, T_i contains T_{i+1} and $\dim(X,T_i) = i$. Various types of these "chains" are possible. For example, if card (X) = c, there is a chain such that each T_i is separable; if card(X) _ c, there is a chain such that each T_i is locally separable.

Some new results in distance geometry, by L. M. Blumenthal, University of Missouri, Columbia. (By invitation.)

The new results discussed are (1) the congruent imbedding of every metric (n + 2)-tuple in the Minkowski space M_n^{∞}; (2) sine laws for simplices, and (3) the homothetic imbedding of all metric triples in a metric space consisting of a metric line G and a point p, not on G.

Earle L Canfield
Sec-Treas