THE APRIL MEETING OF THE IOWA SECTION

The 54th regular meeting of the Iowa Section of the Mathematical Association of America was held at Drake University, Des Moines, on April 21, 1967. Chairman William L. Waltmann presided. Total attendance was 96, 58 of whom were members of the Association. Routine business was considered at the afternoon session.

The Auditing Committee reported that the Treasurer's books were in good order and that a balance of $142.27 was indicated.

The following officers were elected:

Chairman, Charles M. Lindsay, Coe College, Cedar Rapids

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

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

The following motion was made and duly passed " Prof. Earle Canfield was given a standing vote of thanks for his eleven years service to the Iowa Section of MAA as its Secretary-Treasurer."

The following papers completed the program:

Friday morning, April 21, 1967, 9:00-10:50

Karl Menger's contribution to ethics, by Edward S. Allen, Iowa State University.

Karl Menger's MORAL, WILLE UND WELTGESTALTUNG (1934) is a noteworthy application of the mathematical way of thought to ethics. Refuting the possibility of a universally accepted morality, Menger concentrates on the classificationof men according to their desires and the norms of conduct which they choose. The graphical and tabular analysis even of a simple three-way choice is quite complex. The will-group (Willensgruppe) consists of men sufficiently like minded to avoid collision within the group. The author envisages, and would hoe for, will-groups whose codes, though different, would not prevent mutual toleration.

The reversed upper central series in the polarization process in groups, by Donald Pilgrim, Luther College.

Let G be the group and $\{Z_n\}$ be the upper central series of G. If $Z_n = G$ for som positive integer n and if c is the least such integer, we define a chain, K_i, of subgroups of G by: (a) $K_i = Z_{c-i+1}$ if $1 \leq i \leq c$ and (b) $K_i = \{1\}$ if $i \geq c+1$. Call the chain $\{K_i\}$ the reversed upper central series of G. Now suppose we are considering a class, S, of groups defined by one or more identical relations involving commutators; for example, by the fourth Engel condition $(y,x,x,x,x) \equiv 1$. An illustration is given on how the reversed upper central series may be used to determine a bound for the nilpotency class of those groups in S which are nilpotent and have a given number (finite) of generators and have no elements of certain prime orders. Finally, this chain is used to obtain polarized identical relations involving commutators in groups satisfying the fourth Engel condition.

Functions "close" to continuous functions, by A. Irudayanathan, Iowa State University, introduced by the Chairman.

Definitions: $f \in Y^X$ is (weakly) nearly continuous iff for every open cover α of Y, there is a continuous $g \in Y^X$ such that for every $x \in X$, $f(x), g(x) \in U$ for some $U \in \alpha$ (i.e., g is α-near to f). (2) $A \subset Y$ is nearly connected (nearly compact) iff for every open cover α of Y, there is a connected (compact) set $B \subset Y$ such that $A \subset \alpha^*(B)$ and $B \subset \alpha^*(A)$.
$[\alpha^*(A) = \bigcup\{U \in \alpha : U \cap A \neq \emptyset\}]$.

Results: (1) continuity implies near continuity; converse is true if range is regular (satisfies T_3). (2) composition of continuous and nearly continuous functions is nearly continuous; composition of two nearly continuous functions is WEAKLY nearly continuous; (3) nearly continuous images of connected (compact) sets are nearly connected (nearly compact). (4) Nearly connectedness and nearly compactness are both continuous invariants.

Variance estimates in nested designs, by Fred C. Leone, State University of Iowa. (By invitation)

Nested designs are widely publicized and used to isolate and estimate variances with multi-stage processes. Beyond the two-stage design, there is little information on the distributions of the estimates of variance components. "Staggered" designs and "inverted" designs are presently employed to decrease the variance of the estimates of the true variances. These are successful at the upper stages of the design at the expense of increasing the variability at the lower stages. Some results are presented, mostly empirical, for the designs of size forty and eight combinations of variances. The frequency of occurrence of negative estimates of variance components, as well as the very strongly biased results in estimation (in the cases where $H_o : \sigma_i^2 = 0$ is rejected) are emphasized.

Panel Discussion. Problems in the first two years of college mathematics teaching. John C. Friedell (Chairman), Loras College; David Q. Porter, Muscatine Community College; Thomas H. Price, State University of Iowa.

The main problem at the Chairman's college is the varied background and abilities that potential mathematics and science majors bring from high school. All register for the same course as Freshmen, and several weeks of pre-Calculus material are given, including tests; those to begin Calculus immediately are selected, based on all information available. The rest take one or two semesters of preparatory material before beginning Calculus. Mr. Porter asked that larger institutions help the Junior College departments while allowing them to maintain their independence and identity. It is very helpful if the larger universities send back the grades earned by transfer students. Prof. Price agreed that counselling the transfer student about the proper courses to take is of utmost importance. Articulation concerning Calculus courses is needed. Several of those attending offered suggestions about these problems in the discussion that ensued.

Afternoon Session

2:00-4:00 p.m.

The role of axiomatics and problem solving in mathematics, by Fred W. Lott, Jr. State College of Iowa.

The Role of Axiomatics and Problem Solving in Mathematics published by The Conference Board of the Mathematical Sciences was discussed together with its implications for the college mathematics program.

Convergent solutions of ordinary linear homogeneous difference equations in the neighborhood of an irregular singular point, by William J. A. Culmer, Mid-Western College, Denison, Iowa.

This paper deals with the solution of the linear homogeneous difference equation $X(s+1) = s^h A(s)X(s)$, where s is complex, $A(s)$ and $X(s)$ are 2 by 2 matrices and $A(s)$ is representable as a power series in s^{-1} with known coefficients convergent in some neighborhood of $s = \infty$. Formal power series solutions in powers of either s^{-1} or $s^{-\frac{1}{2}}$ are obtained. With one exception these are shown to be asymptotic representations of true solutions in certain regions of the s-plane. The asymptotic series solutions in general diverge, nevertheless are Borel summable and replaceable by convergent factorial series.

Eigenvectors by norm reduction, by Robert Lambert and Richard Sincovec, Iowa State University, Ames, Iowa.

An iterative procedure for finding the eigenvectors of a symmetric matrix is developed based on a new theorem concerning the commutativity of a simple product matrix with the given symmetric matrix. The Euclidean norm of a residual commutator matrix is iteratively reduced by a modified gradient process which changes the simple product matrix successively until the commutator is forced to zero. This will yield both eigenvectors and eigenvalues to high precision. Several examples are given which give more precise results than some other known methods.

Riemann integration in ordered fields, by John M. H. Olmsted, Southern Illinois University, Carbondale, Illinois. (By invitation).

Riemann integrability in an ordered field F is defined by upper and lower step-functions. The collection I of integrable functions is a vector space; also an algebra and lattice. An integrable function may or may not possess an integral. The set D of functions possessing integrals is a vector subspace of I, but may fail to be an ℓ algebra or lattice. If F is Archimedean, then completeness of F is equivalent to each: $D = I$; D is an algebra; D is a lattice. However, ther exist non-Archimedean (hence incomplete) fields in which all three are satisfied.