A defending missile battery is regarded as a server who attempts to perform some operation on each element before that element reaches O. If an element in the queue reaches O without having been served, the server is subject to a risk of disability. The dependence of the process on various parameters (distance between queue elements, probability of disability of server, initial distance of first queue element from objective, etc.) is studied. Various problems concerning the probability distribution of the number of elements served are described. The role of simulation (and its relation to mathematical analysis) in studying such processes is discussed.

2. *Some second thoughts on artificial intelligences*, by Dr. Bradford Dunham, International Business Machines Corporation.

3. *The place of programed instruction in mathematics education*, by Mr. Lewis Eigen, Vice-President, Center for Programed Instruction.

Dr. Bradford F. Hadnot of International Business Machines Corporation announced the formation of the Division of Mathematics of the New York Academy of Sciences and invited all members of the Association to participate in the activities of the Division.

MARY P. DOLCIANI, *Secretary*

THE APRIL MEETING OF THE ROCKY MOUNTAIN SECTION

The 44th annual meeting of the Rocky Mountain Section of the Mathematical Association of America was held at the University of Colorado, Boulder, on April 28–29, 1961. The following officers were elected: Chairman, Professor L. C. Barrett, South Dakota School of Mines and Technology; Vice-Chairman, Professor D. W. Robinson, Brigham Young University; Secretary-Treasurer, Professor Leota C. Hayward, Colorado State University.

The following papers were presented:

1. *Approximating the kth derivatives of a function by sums of Sturm-Liouville eigenfunctions*, by Professor F. M. Stein, Colorado State University.

The author uses eigenfunctions of a family of Sturm-Liouville systems as defined by Dunn and Stein, SIAM Review, January, 1961, to prove the existence of a sum, $S_n(x)$, of such eigenfunctions which uniformly approximates an arbitrary differentiable function, $f(x)$, and whose kth derivative at the same time uniformly approximates the corresponding derivative of $f(x)$. That is, it is proved that there exists a sum, $S_n(x)$, such that $|f^{(k)}(x)-S_n^{(k)}(x)|<\epsilon$, $k=0, 1, \cdots, m$, for $\epsilon>0$ and for all x on $[a, b]$, the closed interval over which $f(x)$ and its derivatives are defined.

2. *Separation axioms between T_0 and T_1*, by Mr. C. E. Aull and Professor W. J. Thron, University of Colorado.

3. *A continuation of the zeta series and its implications*, by Professor W. E. Briggs, University of Colorado.

A standard method of continuing the zeta series $\zeta(s)=\sum_{n=1}^{\infty} n^{-s}$ to the left of $\text{Re}\, s=1$ can be generalized for any integer a greater than 1 by writing $(1-a^{1-s})\zeta(s)=\sum_{n=1}^{\infty}\beta_n n^{-s}$, where $\beta_n=1$ if $a\nmid n$ and $1-a$ if $a|n$. To evaluate the right hand number and its derivatives at $s=1$, first write $\sum_{n\leq x}(\log^k n)/n=(\log^{k+1}x)/(k+1)+\gamma_k+o(1)$. It is now possible to derive the THEOREM. *For integral a and k, $a\geqq 2$, $k\geqq 0$, $\sum_{n=1}^{\infty}(\beta_n \log^k n)/n=(\log^{k+1}a)/(k+1)-\sum_{t=0}^{k-1}\binom{k}{t}\gamma_t \log^{k-t}a$, where the summation on the right is zero for $k=0$.* By solving these equations for γ_t, one immediately obtains the principal result of a paper by Kluyver (Quar. J. Math., vol. 50, 1927, 185–192). In particular this gives $\gamma=\frac{1}{2}\log a-\sum_{n=1}^{\infty}(\beta_n/n)\log_a n$.

4. *Methods of proving mean value theorems*, by Professor L. C. Barrett, South Dakota School of Mines.

The primary purpose of this paper is to emphasize the equivalence of various proofs of the extended law of the mean, including analytic, geometric, vector, and determinant types of proof. A yet more general method of generating mean value theorems is also given.

5. *Utilizing Green's functions to solve nonhomogeneous differential systems*, by Professor L. C. Barrett and Mr. R. A. Jacobson, South Dakota School of Mines.

In this paper we give an example showing how the solution of a system consisting of n ordinary first-order linear differential equations and n linearly independent two-point boundary conditions can be obtained by utilizing a Green function. The equations, as well as the boundary conditions, may be nonhomogeneous.

6. *Symmetric Boolean functions*, by Professor C. H. Cunkle, Utah State University.

7. *Homomorphisms on certain multiplicative semigroups*, by Professor R. S. DeZur, San Diego State College.

8. *Circular and spherical probability problems*, by Professor W. C. Guenther, The Martin Company and the University of Wyoming.

9. *On the permanence of formal laws*, by Professor Edgar Karst, Brigham Young University.

The author tried to generalize proofs in establishing as a main rule: The results of all mathematical operations which follow a certain arithmetical, geometric, or logical iteration pattern are proved to be correct by the permanence of formal laws. He treated four versions of multiplication in the base 8, partly in the decimal mode, with and without conversion to binary, the last one failing because of uncertainty in the logical structure. The third version, based on a modified method of Bhaskara, works for all bases from 2 to 10, and, built in the hardware of an electronic computer, would yield 8 times more versatility, with only a small loss in machine time.

10. *The Committee on the Undergraduate Program in Mathematics*, by Professor R. C. Buck, University of Wisconsin, Chairman of the Committee.

11. *Student versus teacher*, by Professor Edward Anlian, U. S. Air Force Academy.

12. *Guesses on prime numbers*, by Professor Emeritus A. J. Kempner, University of Colorado.

13. *The behavior of solutions of ordinary, self-adjoint differential equations of arbitrary even order*, by Mr. Robert Hunt, University of Utah.

The differential equation $(r(x)y^{(n)})^{(n)}+p(x)y=0$, $r(x)>0$, $p(x)\neq 0$ on $[a, \infty)$ is studied with regards to the existence of various types of zeros of its solutions. Of chief interest in the first part of the paper are solutions with two nth order zeros and solutions $y(x)$ with an nth-order zero followed by an nth-order zero of $r(x)y^{(n)}(x)$. In the latter part of the paper, zeros of types which do not seem to lend themselves to variational methods are considered, and separation and oscillation properties are studied for the case $p(x)>0$.

14. *Thoughtful algebra carries its own insurance*, by Professor A. W. Recht, University of Denver.

Mathematics teachers waste much time marking mistakes in algebra that should never have been made. Errors results from mechanical manipulation, makeshift tricks used and forgotten almost as soon as devised. Better to go back to fundamentals for every step, to provide a strand of good common sense that holds everything logical together. Even then we are not back to fundamentals often enough. To avoid bickering, students are furnished lists of exercises that illustrate mandatory methods with fundamental steps. Final warning: if student doesn't follow directions when they don't seem to matter, how can he follow them when they do matter?

15. *Mathematical curriculum for engineers and scientists*, by Professor I. I. Kolodner, University of New Mexico.

LEOTA C. HAYWARD, *Secretary*