(3) *Phragmén-Lindelöf theorems for generalized subharmonic functions*, by Professor L. K. Jackson, University of Nebraska, introduced by the Secretary.

The notion of subharmonic function is generalized by replacing the dominating family of harmonic functions by a more general family of functions. It is shown that an analogue of the principle of the maximum modulus holds for these generalized subfunctions. This property is used to prove theorems of the Phragmén-Lindelöf type. Solutions of certain types of elliptic differential equations are shown to be examples of such functions.

(4) *Ideals and the prime factorization theorem*, by Miss F. Marion Clarke, University of Nebraska.

The author demonstrated the failure of the fundamental theorem of arithmetic in certain algebraic fields, showed the validity of an analogous theorem with respect to ideals instead of integers, sketched the generalization of this theorem for transcendental extensions and indicated the rule of irreducibility and maximality in characterizing the property of being prime.

(5) *A development of the identities for* $\sin(\alpha+\beta)$ *and* $\cos(\alpha+\beta)$, by Professor A. K. Bettinger, Creighton University.

The new feature of this development is a variation in the geometric construction which greatly simplifies the proof. Application was also made to the rotation formulas in plane analytic geometry.

(6) *Some recent developments of the analysis of the logical foundations and methods of algebra*, by Professor H. B. Ribeiro, University of Nebraska.

Included was a discussion of metamathematical proofs in algebra followed by an introduction to Tarski's mathematical theory of arithmetical classes of algebraic systems and its applications.

The afternoon session was devoted to a discussion of the problems of the teaching of secondary school mathematics. A panel composed of persons representing the university, the small college, the high school, and the administrators, led the discussion. Members of the Association on the panel were Professor W. G. Leavitt, University of Nebraska, and Professor C. B. Gass, Nebraska Wesleyan University.

EDWIN HALFAR, *Secretary*

THE MAY MEETING OF THE ROCKY MOUNTAIN SECTION

The thirty-fifth annual meeting of the Rocky Mountain Section of the Mathematical Association of America was held at Western State College of Colorado, Gunnison, Colorado, on May 23 and 24, 1952. Professor C. H. Cook, Western State College of Colorado, presided.

Forty-nine persons registered including the following thirty-seven members of the Association:

C. F. Barr, J. R. Britton, R. G. Buschman, F. M. Carpenter, H. W. Charlesworth, C. H. Cook, G. S. Cook, Mary C. Doremus, Albert Edrei, F. N. Fisch, H. T. Guard, R. R. Gutzman, J. R. Hanna, I. L. Hebel, Anna S. Henriques, C. A. Hutchinson, B. W. Jones, M. W. Jones, A. J. Kempner, Claribel Kendall, F. A. Kros, J. S. Leech, M. L. Madison, Greta Neubauer, D. O. Patterson, Lily B. Powell, Nathan Schwid, S. R. Smith, W. N. Smith, L. C. Snively, K. H. Stahl, P. O. Steen, Wilmont Toalson, E. P. Tovani, E. L. Vanderburgh, V. J. Varineau, W. W. Varner.

At the business meeting the following officers were elected: Chairman, Professor B. W. Jones, University of Colorado; Vice-Chairman, Professor C. F. Barr, University of Wyoming; Secretary-Treasurer, Professor J. R. Britton, University of Colorado. It was decided to hold the next annual meeting at the University of Colorado, the date to be announced later. Upon a motion by H. T. Guard it was voted to donate the sum of $25 to the Wald Memorial Fund.

The following papers were presented:

1. *The spirit of discovery in mathematics*, by Professor B. W. Jones, University of Colorado.

Attention was called to some of the similarities between our international situation and our educational difficulties. In both we are apt to blame sinister, all-powerful, and all-wise forces outside our control. Actually what danger there is at present is chiefly from within. It is up to us to adopt an aggressive rather than a defensive attitude in both cases and with due modesty to realize that we have already made some impressive improvement over the past. Not the least of our opportunities in the field of education is to cultivate in our students from kindergarten upward a spirit of discovery. We should not do all the exploration for them but should rather encourage them in their natural curiosity so that our pioneering heritage may be perpetuated in the realm of the mind.

2. *Mathematics applied to the calculation of rocket trajectories*, by Mr. F. A. Kros, University of Colorado.

The following method can be used to determine the position of a rocket at any instant using data from three camera stations. Let the lines of sight from the camera to the rocket be written in the form $x=x_0+\lambda r_1$, $y=y_0+\mu r_1$, $z=z_0+\nu r_1$, where (x_0, y_0, z_0 are the coordinates of the camera, λ, μ, ν are the direction cosines of the line of sight and r_1 is the distance from the camera to any point (x, y, z) on this line. Consider a function $D=f(r_1, r_2, r_3)$ such that D is the sum of the squares of the distances between points on each of the three lines. Minimizing this function gives us three linear equations in the r's, the solution of which determines three points on the lines of sight. The average of these three points gives the centroid of the triangle determined by them. This centroid is taken as the best approximation of the rocket's position.

3. *Forms for the solution of spherical triangles*, by Mr. E. L. Vanderburgh, Pueblo College.

A booklet was distributed which the author uses in teaching spherical trigonometry in seven to ten lessons. Three forms, each with the formulas needed and with solution outlines, are used to solve the six cases of oblique spherical triangles. The number of formulas is kept to a minimum and each one is derived in a form students of trigonometry can easily follow. By using the forms, it was pointed out, students can spend their time on the numerical work and easily check results on the form in the place provided. Also, since the complete plan is on the form, one can solve similar problems many years later by use of the forms and a very little review. Six students, over a period of four years, helped prepare the booklet as a part of their trigonometry courses.

4. *A minimum problem in Banach spaces*, by Professor J. S. Leech, Colorado College.

In Monatshefte für Mathematik, XXXII Band, 1922, pp. 204–218, Georg Pick considers the following problem: Let $f(z)$ be a function analytic in the unit circle, $|z|<1$. Among all such functions satisfying the conditions (1) $f(z_k)=\alpha_k$, $k=1, 2, \cdots, n$, where $z_1, z_2, \cdots, z_n$ and $\alpha_1, \alpha_2, \cdots, \alpha_n$ are given complex numbers such that $|z_k|<1$, what function makes the integral $I=\int_0^{2\pi}|f(e^{i\theta})|^2 d\theta$ a minimum? Pick shows that this problem always has a unique solution.

A generalization of this problem to arbitrary Banach spaces may be stated as follows: If $f_1, f_2, \cdots, f_n$ are n given functionals defined on a Banach space X, what element $x \epsilon X$ satisfying (2) $f_k(x) = \alpha_k$, $k = 1, 2, \cdots, n$, has the least norm? We will refer to this as the minimum problem.

The principal result obtained is: In a Banach space X, in order that every minimum problem have a unique solution, it is necessary and sufficient that X be reflexive and strictly convex. In particular, L_2 is both reflexive and strictly convex; hence every minimum problem in L_2 has a unique solution. In this case, it is shown how to construct this minimum solution.

5. *The roots of a certain exponential equation*, by Professor W. N. Smith, University of Wyoming.

The equation considered is of the form

$$A_1(\lambda, \nu) - A_2(\lambda, \nu)e^{\lambda R_1} + A_3(\lambda, \nu)e^{\lambda(R_1+R_2)} - A_4(\lambda, \nu)e^{\lambda R_2} = 0,$$

where R_1 and R_2 are complex constants, and the $A_i(\lambda, \nu)$ are asymptotically representable by power series in $1/\lambda$ with coefficients which are at most quadratic in ν. It is desired to solve for λ as a function of the complex variable ν, with $|\lambda|$ taken to be large and $|\nu|$ small. The equation is studied by means of approximation equations. Two of these are explicitly solvable for λ and are independent of ν. The other two may be regarded, after certain conditions have been imposed upon ν, as defining λ as an infinity of distinct single-valued functions of ν. As ν approaches zero along a suitable path these functions are found to lie in subregions of the λ-plane. Finally it is shown that the roots of the approximation equations actually represent the roots of the given equation asymptotically.

6. *A singular integral equation*, by Professor Albert Edrei, University of Colorado.

J. R. BRITTON, *Secretary*

THE MAY MEETING OF THE UPPER NEW YORK STATE SECTION

The annual meeting of the Upper New York State Section of the Mathematical Association of America was held at Hobart and William Smith Colleges, Geneva, New York, on May 10, 1952. The Chairman of the Section, Professor C. W. Munshower of Colgate University, presided at the morning session; the Vice-Chairman, Professor J. F. Randolph of the University of Rochester, presided at the afternoon session. At the conclusion of the afternoon session a tea was served to members and guests.

Ninety-seven persons attended the meeting, including the following seventy-two members of the Association:

H. T. R. Aude, H. W. Baeumler, Frances E. Baker, M. R. Bates, W. R. Baum, R. A. Beaver, R. L. Beinert, Dorothy L. Bernstein, W. W. Bessell, H. F. Bligh, F. J. H. Burkett, K. A. Bush, E. A. Butler, W. B. Carver, Nancy Cole, Geraldine A. Coon, A. E. Danese, W. A. Dolid, E. J. Downie, Walter H. Durfee, William H. Durfee, G. V. Emerson, H. W. Eves, Jean B. Feidner, A. D. Fleshler, C. W. Foard, A. H. Fox, J. E. Freund, H. M. Gehman, B. H. Gere, J. C. Gibson, Lillian Gough, N. G. Gunderson, H. K. Holt, Anna M. Howe, J. R. F. Kent, D. E. Kibbey, F. W. Lane, R. D. Larsson, Caroline A. Lester, R. C. Luippold, R. W. MacDowell, Dis Maly, E. W. Marchand, Harriet F. Montague, Mabel D. Montgomery, L. J. Montzingo, D. S. Morse, Abigail M. Mosey, C. W. Munshower, W. V. Nevins, III, F. D. Parker, W. B. Pitt, Theresa L. Podmele, L. R. Polan, J. F. Randolph, C. E. Rhodes, M. F. Rosskopf, P. T. Schaefer, Edith R. Schneckenburger, W. A. Small, S. T. Smith, Ruth W. Stokes, Mary C. Suffa, Nura D. Turner, G. W. Walker, R. J. Walker, F. C. Warner, A. E. Whitford, Mary E. Williams, A. G. Wootton, Frances M. Wright.