$GF[13^2]$, $i^2 \equiv i + 11$, modulo 13. $i^\lambda = \alpha i + \beta$.

SECOND TABLE.—*Continued.*

λ	α	β	λ	α	β	λ	α	β	λ	α	β
75	7	10	160	9	1	61	10	5	17	11	9
22	7	11	133	9	2	142	10	6	130	11	10
156	7	12	148	9	3	59	10	7	40	11	11
43	8	0	41	9	4	161	10	8	19	11	12
107	8	1	31	9	5	11	10	9	85	12	0
81	8	2	9	9	6	82	10	10	13	12	1
129	8	3	144	9	7	37	10	11	86	12	2
131	8	4	114	9	8	8	10	12	123	12	3
139	8	5	54	9	9	99	11	0	120	12	4
38	8	6	108	9	10	119	11	1	116	12	5
78	8	7	33	9	11	27	11	2	5	12	6
152	8	8	151	9	12	163	11	3	105	12	7
63	8	9	141	10	0	100	11	4	149	12	8
44	8	10	136	10	1	94	11	5	80	12	9
90	8	11	4	10	2	137	11	6	132	12	10
74	8	12	69	10	3	146	11	7	3	12	11
113	9	0	20	10	4	134	11	8	26	12	12

NOTES.

THE July number (volume 6, number 3) of the *Transactions* of the AMERICAN MATHEMATICAL SOCIETY contains the following papers: "Sur les lignes géodésiques des surfaces convexes," by H. POINCARÉ; "The classification of quadrics," by T. J. I'A. BROMWICH; "On differential invariants," by J. E. WRIGHT; "Groups of order p^m, which contain cyclic subgroups of order p^{m-3}," by L. I. NEIKIRK; "On the invariant subgroups of prime index," by G. A. MILLER; "On a general method for treating transmitted motions and its application to indirect perturbations," by E. W. BROWN; "On hypercomplex number systems," by L. E. DICKSON; "A theorem on finite algebras," by J. H. MACLAGAN-WEDDERBURN; "The relation of the principles of logic to the foundations of geometry," by J. ROYCE; "On multiple integrals," by J. PIERPONT.

THE July number (volume 27, number 3) of the *American Journal of Mathematics* contains: "Deduction of the power series representing a function from special values of the latter," by G. W. HILL; "On the definition of reducible hypercomplex number systems," by S. EPSTEEN and H. B. LEONARD;

"Quintic curves for which $p = 1$," by P. FIELD; "Classification of the surfaces of singularities of the quadratic spherical complex," by C. L. E. MOORE; "Subgroups of order a power of p in the general and special m-ary linear homogeneous groups in the $GF[p^n]$," by L. E. DICKSON.

THE concluding (July) number of volume 6 of the *Annals of Mathematics* contains: "On the real elements of certain classes of geometrical configurations," by L. E. DICKSON; "The continuum as a type of order; an exposition of the modern theory, I–IV," by E. V. HUNTINGTON; "On integrating factors," by P. SAUREL; "Concerning series of analytic functions," by M. B. PORTER.

THE conference of associations of teachers of mathematics and physics, held at Asbury Park on July 5 in connection with the meeting of the National educational association was attended by thirty-seven delegates representing nearly all the larger teachers' associations in this field. Professor THOMAS S. FISKE was elected chairman, and Dr. ARTHUR SCHULTZE secretary of the conference. It was decided to organize a national society of teachers of mathematics and science and a committee was appointed to arrange the details of the organization.

WHILE in this country last autumn Professor G. Darboux became interested in the proper reporting of articles appearing in American mathematical publications for the *Bulletin des sciences mathématiques*. Arrangements have been made by which the *American Journal of Mathematics*, the *Transactions of the American Mathematical Society* and the *Annals of Mathematics* will be regularly reviewed in Darboux's *Bulletin* by Professor J. W. YOUNG, of Princeton University, Professor E. R. HEDRICK, of the University of Missouri, and Dr. C. M. MASON, of Yale University, respectively. Articles of an original nature appearing in the BULLETIN will also be mentioned. Authors of articles in these publications will render valuable service by furnishing abstracts of their articles to the respective reviewers.

THE following books will shortly appear from the G. J. Göschen'sche publishing house, Leipzig: "Auslese aus meiner Unterrichts- und Vorlesungspraxis," by Dr. H. SCHUBERT; "Vorlesungen über photographische Optik," by Dr. A. GLEICHEN; "Zwölf Vorlesungen über die Natur des Lichtes,"

by Dr. J. CLASSEN; "Mehrdimensionale Geometrie, II. die Polytope (Sammlung Schubert, number 36)," by Professor P. H. SCHOUTE.

UNIVERSITY OF COLORADO. — The following advanced courses in mathematics are announced for the academic year 1905–1906: By Professor I. M. DELONG: Theory of equations, five hours; Differential equations, three hours. — By Dr. S. EPSTEEN: Linear algebra, three hours; Least squares and theory of errors, three hours; Mathematics of investments (including insurance), three hours. — By Mr. H. B. LEONARD: Theory of Functions, three hours. — By Miss R. L. CARSTENS: History of mathematics, two hours.

THE various foreign universities below offer courses in mathematics for the winter semester of 1905–1906 as follows:

UNIVERSITY OF GÖTTINGEN. — By Professor F. KLEIN: Projective geometry, including non-euclidean geometry, four hours; Seminar, two hours. — By Professor D. HILBERT: Introduction to partial differential equations, two hours; Mechanics, four hours; Seminar, two hours. — By Professor H. MINKOWSKI: Algebraic curves and surfaces, two hours; Theory of numbers, four hours; Seminar (with Professor Hilbert), two hours. — By Professor C. RUNGE: Differential and integral calculus, II, four hours; Graphical methods in mechanics, three hours. — By Professor K. SCHWARZSCHILD: Celestial mechanics, II, three hours. — By Professor W. VOIGT: Elasticity and acoustics, four hours; Electro-optics, two hours. — By Dr. E. ZERMELO: Functions of real variables, three hours. — By Dr. M. ABRAHAM: Maxwell's theory and Hertzian waves, three hours. — By Dr. O. BLUMENTHAL: Theory of surfaces, three hours. — By Dr. C. HERGLOTZ: Minimum surfaces, two hours. — By Dr. C. CARATHÉODORY: Continuous groups, three hours.

UNIVERSITY OF HALLE. — By Professor G. CANTOR: Theory of analytic functions, four hours; Seminar, two hours. — By Professor A. WANGERIN: Applications of elliptic functions, two hours; Theory of potential and spherical harmonics, four hours; Seminar, two hours. — By Professor A. GUTZMER: Analytic mechanics, four hours; Theory and applications of determinants, two hours; Seminar, two hours. — By Professor V. EBERHARD: Integral calculus, four hours; with

exercises, one hour. — By Dr. F. BERNSTEIN: Analytic geometry of space, two hours; Theory of differential equations, two hours.

UNIVERSITY OF INNSBRUCK. — By Professor O. STOLZ: Differential and integral calculus of real variables, three hours; Concept of complex numbers as introduction to the theory of functions, two hours; Seminar, one hour. — By Professor K. ZINDLER: Analytic geometry of two and three dimensions, with exercises, seven hours. — By Professor K. MENGER: Descriptive geometry, three hours.

UNIVERSITY OF JENA. — By Professor J. THOMAE: Elementary theory of functions, four hours; Analytic geometry of space, four hours; Seminar, two hours. — By ——— (not yet appointed): Integral calculus with exercises, five hours; Theory and applications of determinants, two hours; Elements of the theory of numbers, two hours. — By Professor G. FREGE: Analytic mechanics, four hours; Seminar, two hours.

UNIVERSITY OF KÖNIGSBERG. — By Professor W. F. MEYER: Theory of algebraic equations, four hours; Seminar, one hour. — By Professor A. SCHOENFLIES: Integral calculus, four hours; with exercises, two hours. — By Professor L. SAALSCHÜTZ: Introduction to algebraic analysis, four hours; Geometry of space, three hours; with exercises, one hour. — By Dr. I. COHN: Theory of potential, three hours.

UNIVERSITY OF MUNICH. — By Professor G. BAUER: Seminar, two hours. — By Professor F. LINDEMANN: Differential calculus, five hours; Analytic mechanics, four hours; Seminar, one and one half hours. — By Professor A. VOSS: Plane analytic geometry, five hours; Algebraic surfaces, four hours; Seminar, two hours. — By Professor A. PRINGSHEIM: Elliptic functions, four hours; Continued fractions, two hours. — By Professor K. DOEHLEMANN: Descriptive geometry, I, five hours; with exercises, three hours; Synthetic geometry, five hours; with exercises, one hour. — By Professor E. v. WEBER: Algebra, four hours; Integral calculus with exercises, five hours. — By Dr. H. BRUNN: Theory of aggregates, four hours.

OXFORD UNIVERSITY. *Michaelmas term.* — By Professor W. ESSON: Analytic geometry of plane curves, two hours;

Synthetic geometry of plane curves, one hour. — By Professor E. B. ELLIOTT: Sequences and series, two hours; Elementary theory of numbers, one hour. — By Professor A. E. H. LOVE: Mathematical theory of electricity and magnetism, three hours. — By Professor H. H. Turner: Elementary mathematical astronomy, two hours. — By Mr. C. E. HASELFOOT: Theory of equations, one hour. — By Mr. C. LEUDESDORF: Projective geometry, three hours. — By Mr. A. E. JOLLIFFE: Analytic geometry, two hours. — By Mr. J. W. RUSSELL: Differential calculus, two hours. — By Mr. B. F. MCNEILE: Curve tracing, one hour. — By Mr. A. L. PEDDER: Problems in pure mathematics, one hour. — By Mr. C. H. SAMPSON: Solid geometry, two hours. — By Mr. J. E. CAMPBELL: Differential equations, two hours. — By Mr. C. H. THOMPSON: Integral calculus, two hours.

UNIVERSITY OF WÜRZBURG. — By Professor F. PRYM: Differential calculus with introduction to higher analysis, four hours; Plane analytic geometry, I, four hours; Proseminar, two hours; Seminar, two hours. — By Professor E. SELLING: Theory of algebraic equations, four hours; Analytic mechanics, four hours. — By Professor G. ROST: Theory of partial differential equations, four hours; Theory of invariants, four hours; Analytic geometry of space, four hours; Proseminar, six hours; Seminar, two hours.

THE Academy of sciences of Berlin held its Leibniz session on June 29. The Steiner prize was not awarded, but the sum of six thousand marks was set apart in recognition of the investigations of the late Professor GUIDO HAUCK. For the year 1910 the Academy announces the same problem for the third time for the Steiner prize:

"To solve completely any important, hitherto unsolved problem relating to the theory of curved surfaces, taking into account, so far as possible, the methods and principles evolved by Steiner. It is required that sufficient analytic explanations shall accompany the geometric investigations to verify the correctness and completeness of the solution. Without wishing to limit the choice of subject, the academy takes the opportunity to call attention to the special problems to which Steiner has referred in his general remark at the end of his second paper on maximum and minimum in figures in a plane, on a sphere, and in space."

Competing memoirs should be written in German, French, English, Italian or Latin, and must be submitted before December 31, 1909, under the usual conditions. The result will be announced at the Leibniz session of 1910.

THE London mathematical society has awarded the De Morgan prize for the present year to Dr. H. F. BAKER, for his work in analysis.

THE Hungarian academy of sciences has established a new prize, known as the Bolyai prize, in commemoration of JOHN and WOLFGANG BOLYAI. It consists of a medal and a sum of ten thousand crowns. It will be awarded this fall to the author of the best mathematical production during the last five years, and at intervals of five years thereafter. The committee of award consists of Professors Darboux, Klein, König and Rados; it will meet in Budapest in October.

PROFESSOR W. WIRTINGER has been elected a member of the academy of sciences of Vienna.

PROFESSOR J. FRANEL, of the technical school at Zürich, has been chosen director of that institution.

MR. E. T. WHITTAKER, of Trinity College, Cambridge, has been appointed university lecturer in mathematics.

PROFESSOR J. E. PAPPERITZ, of the mining academy at Freiberg, has been elected rector of the academy for the present academic year.

PROFESSOR C. NEUMANN, of the University of Leipzig, has been decorated with the red cross of the second class.

PROFESSOR W. VOIGT, of the University of Göttingen, has been decorated with the order of the red cross of the third class.

DR. H. C. TIMERDING has been appointed professor of applied mathematics at the University of Strassburg.

PROFESSOR A. GUTZMER, of the University of Jena, has been appointed professor of mathematics at the University of Halle.

PROFESSOR L. HEFFTER, of the technical school at Aachen, has been appointed professor of mathematics at the University of Kiel.

DR. O. BLUMENTHAL, of the University of Göttingen, has been appointed professor of mathematics at the technical school at Aachen.

DR. L. FEJER has been appointed docent in analysis and mechanics at the University of Clausenburg.

THE following changes have been made at the University of Illinois: Professor E. J. TOWNSEND has been made full professor of mathematics and acting dean of the college of science; Professor S. E. SLOCUM, of the University of Cincinnati, has been appointed to an assistant professorship of mathematics; Dr. L. NEIKIRK, of the University of Pennsylvania, has been appointed instructor in mathematics, and Mr. W. J. RISLEY, of the Armour Institute, and M. C. EMMENS, of Albion College, have been made assistants in mathematics. Professor A. G. HALL has been appointed professor of mathematics in Miami University, and Mr. A. H. WILSON has been appointed associate professor of mathematics at the Polytechnic Institute of Alabama.

THE College entrance examination board has appointed as examiners in mathematics for 1905–1906 Professor F. N. COLE, Professor H. S. WHITE, and Dr. ARTHUR SCHULTZE.

DR. D. R. CURTISS, of Yale University, has been appointed to an assistant professorship of mathematics at Northwestern University.

AT the University of Missouri, Dr. O. D. KELLOGG of Princeton University has been appointed to an assistant professorship of mathematics, and Mr. R. L. BORGER, of the University of Florida, to an instructorship in mathematics.

AT Northwestern University, Professor THOMAS F. HOLGATE has been appointed Noyes professor of pure mathematics; Mr. R. E. WILSON has returned from Europe to resume his work as instructor in mathematics; Dr. J. C. MOREHEAD has been appointed instructor in mathematics.

AT Princeton University Dr. L. P. EISENHART and Dr. W. GILLESPIE have been promoted to assistant professorships of mathematics. Dr. O. VEBLEN, of the University of Chicago, and Dr. J. W. YOUNG, of Northwestern University, have been appointed assistant professors of mathematics, and Dr. O. L. UNDERHILL instructor in mathematics.

DR. L. I. HEWES has been appointed instructor in mathematics at Yale University.

DR. R. B. ALLEN has been appointed lecturer in mathematics at Clark University during Professor Taber's absence.

DR. S. EPSTEEN, of the University of Chicago, has been appointed instructor in applied mathematics at the University of Colorado.

PROFESSOR A. EMCH, of the University of Colorado, has been appointed professor of mathematics at the cantonal college of Solothurn, Switzerland.

DR. O. P. AKERS has been appointed assistant professor of mathematics at Allegheny College, Meadville, Pennsylvania.

RECENT catalogues of second-hand mathematical books: Macmillan and Bowes, 1 Trinity St., Cambridge, England, catalogue no. 305, 5300 mathematical pamphlets; catalogue no. 302, from the libraries of Pendlebury, Spottiswoode and Whitehead, about 1400 titles in mathematics. — Martin Boas, Karltrasse 25, Berlin, catalogue no. 49, 56 titles in mathematics and geodesy. — H. R. Mecklenburg, 36 Klosterstrasse, Berlin, 750 titles in mathematics and geodesy.

NEW PUBLICATIONS.

I. HIGHER MATHEMATICS.

AMODEO (F.). Lezioni di geometria proiettiva dettata nella r. Università di Napoli. 3a edizione. Napoli, Pierro, 1905. 8vo. 14 + 456 pp.

BACHMANN (P.). Zahlentheorie. Versuch einer Gesamtdarstellung dieser Wissenschaft in ihren Hauptteilen. Band V: Die allgemeine Arithmetik der Zahlenkörper. Leipzig, Teubner, 1905. 8vo. 22 + 548 pp. M. 16.00

BERKHAU (G.). Zur projektiven Behandlung der Dreiecksgeometrie. (Diss.) Königsberg, 1905. 8vo. 31 pp.

BOCCHETTA (G.). Principi di geometria metrica e differenziale negli iperspazi. Melfi, Grieco, 1905. 8vo. 26 pp.

CAIN (W.). A brief course in the calculus. New York, Van Nostrand, 1905. 8vo. 10 + 280 pp. Cloth. (Van Nostrand series of text-books.) $1.75

COMBÉBIAC (G.). Calcul des triquaternions; nouvelle analyse géométrique. (Thèse.) Paris, Gauthier-Villars, 1905. 4to. 122 pp.

CREFCOEUR (A. J. M.). Cours d'analyse. Partie II: Calcul des différences et calcul des variations. Paris, 1905. 8vo. Fr. 3.50