

If $f(x)$ is integrable in Riemann's sense then this new definition of the integral coincides with the ordinary one. Perhaps the relation of these two ideas is most clearly shown by means of the geometric conception of the integral as the difference between the two-dimensional measure of the set of points in $[a, b]$ having positive ordinates for which $0 < y < f(x)$, and that of the set of points for which these signs of inequality must be reversed. If these measures exist according to Jordan's definition, their difference is the integral in Riemann's sense; the insertion of the words "or enumerably infinite" in the right place in the definition of measure gives us the Lebesgue integral.

In so brief a notice as this it is impossible even to indicate the many applications which the author makes of this new and powerful instrument of analysis. There still remain unsolved cases of the problem of the primitive function, *i. e.*, the problem of determining a function whose derivative is given, but the solution is found in many cases where the ordinary integral cannot be used. In particular the question is settled whenever the given function is limited, or when it is known that the primitive function must be of limited variation. And in the case of rectifiable curves the Lebesgue integral gives their length whenever the functions $x(t)$, $y(t)$, $z(t)$ which define the curve have limited derivative numbers.

The treatment of several topics connected with the main subject should be mentioned, especially the chapters and sections on functions of limited variation and on derivative numbers. The volume closes with an admirably clear and concise note on point sets and transfinite numbers.

D. R. CURTISS.

NOTES.

AT the meeting of the London mathematical society held on May 14 the following papers were read: By P. A. МАС-МАНОН, "On the invariants of the general linear homogeneous transformation in two variables"; by H. HILTON, "On the order of the group of isomorphisms of an abelian group."

A NEW academy of sciences has been established in Finland, with seat at Helsingfors. Two sections have been organized, one consisting of mathematics and the physical sciences, the other consisting of philology and philosophy.

THE French association for the advancement of science will hold its annual meeting at Clermont Ferrand during the first week in August.

THE following advanced courses in mathematics are offered during the academic year 1908-1909 :

JOHNS HOPKINS UNIVERSITY. — By Professor F. MORLEY : Higher geometry, two hours ; Dynamics, two hours (first half year) ; Theory of functions, two hours (second half year) ; Reading course, one hour ; Seminary, one hour. — By Dr. A. COHEN ; Introduction to the theory of functions, two hours ; Differential equations and differential geometry, two hours. — By Dr. A. B. COBLE : Theory of groups, two hours.

UNIVERSITY OF PENNSYLVANIA. — By Professor E. S. CRAWLEY : Modern analytic geometry, two hours ; Theory of numbers, three hours. — By Professor G. E. FISHER : Differential equations, two hours ; Elliptic functions, three hours (first half year) ; Topics in the theory of differential equations, three hours (second half year). — By Professor I. J. SCHWATT : Infinite series and products, two hours. — By Professor G. H. HALLETT : Lie's theory of continuous groups, three hours (first half year) ; Galois's theory of equations, three hours (second half year) ; Groups of finite order, three hours. — By Professor F. H. SAFFORD ; Curvilinear coordinates, three hours ; Partial differential equations, three hours. — By Dr. O. E. GLENN ; Invariants, three hours.

UNIVERSITY OF BOLOGNA. — By Professor C. ARZELA : Dirichlet's principle, calculus of variations, three hours. — By Professor L. DONATI : Mathematical theory of elasticity, physical optics, three hours. — By Professor S. PINCHERLE : Algebraic functions and their integrals, elliptic functions, analytic functions represented by definite integrals, three hours.

UNIVERSITY OF CATANIA. — By Professor M. DE FRANCHIS : Geometry on algebraic curves, Riemann's surfaces and abelian integrals, inversion, four and a half hours. — By Professor S. LAURICELLA : Optics, four and a half hours. — By Professor G. PENNACCHIETTI : Elliptic functions with applications to mechanics, four and a half hours. — By Professor C. SEVERINI : Application of Lie's theory of continuous groups to differential equations, researches of Picard and Vessiot, four and a half hours.

UNIVERSITY OF GENOA.—By Professor G. FUBINI: Theory of continuous groups and of automorphic functions, three hours.—By Professor G. LORIA: Infinitesimal geometry, three hours.—By Professor O. TEDONE: Maxwell's theory of electromagnetic fields, three hours.

UNIVERSITY OF MESSINA.—By Professor G. BAGNERA: Partial differential equations of the second order, three hours.—By Professor T. BOGGIO: Integral equations with applications to mathematical physics, three hours.—By Professor V. MARTINETTI: Theory of algebraic plane curves and surfaces, curves and surfaces of order 3, three hours.

UNIVERSITY OF NAPLES.—By Professor F. AMODEO: History of mathematics: The XVIII century, three hours.—By Professor A. CAPELLI: Theory of algebraic forms, four and a half hours.—By Professor R. MARCOLONGO: Theory of potential and integral equations, mathematical theory of elasticity, four and a half hours.—By Professor D. MONTESANO: Line geometry, birational transformations of the plane and space, four and a half hours.—By Professor E. PASCAL: Partial differential equations of the second order, three hours.—By Professor L. PINTO: Physical optics, four and a half hours.

UNIVERSITY OF PADUA.—By Professor F. D'ARCAIS: Discontinuous groups of linear transformations, elliptic and modular functions, four and a half hours.—By Professor A. FAVARO: History of optics, especially the invention of the telescope, three hours.—By Professor P. GAZZANIGA: Theory of numbers, three hours.—By Professor T. LEVI-CIVITA: Hydrodynamics, four and a half hours.—By Professor G. RICCI: Mathematical theory of elasticity with applications to optics, four hours.—By Professor F. SEVERI: Theory of continuous groups, two hours; algebraic functions of two variables, two hours.—By Professor G. VERONESE: Synthetic geometry of hyperspaces, four hours.

UNIVERSITY OF PALERMO.—By Professor M. GEBBIA: Mechanics of continua, newtonian attraction, hydrostatics and hydrodynamics, four and a half hours.—By Professor G. B. GUCCIA: General theory of algebraic curves and surfaces, four and a half hours.—By Professor A. VENTURI: Modern views on celestial mechanics, four and a half hours.

UNIVERSITY OF PAVIA.—By Professor E. ALMANSI:

Hydrostatics and hydrodynamics, three hours. — By Professor L. BERZOLARI: Algebraic curves and surfaces, three hours. — By Professor G. VIVANTI: Calculus of variations, three hours.

UNIVERSITY OF PISA. — By Professor E. BERTINI: Geometry of hyperspace, algebraic geometry with applications, three hours. — By Professor L. BIANCHI: Functions of a complex variable, general properties of automorphic functions, four and a half hours. — By Professor U. DINI: Advanced calculus, Bessel functions and integral equations, four and one half hours. — By Professor G. A. MAGGI: Theory of electromagnetic phenomena with special regard to the new hypothesis, four and a half hours. — By Professor P. PIZZETTI: Principles of spherical astronomy, theory of the figures of planets, three hours.

UNIVERSITY OF ROME. — By Professor G. CASTELNUOVO: Algebraic functions of one variable and their integrals, three hours. — By Professor V. CERRUTI: Partial differential equations of the first order, three hours. — By Professor L. ORLANDO: Definite integrals and their application to mathematical physics, three hours. — By Professor V. VOLTERRA: Hydrodynamics, four hours.

UNIVERSITY OF TURIN. — By Professor E. D'OVIDIO: Theory of functions of a complex variable, abelian integrals, three hours. — By Professor G. MORERA: Newtonian potential and attraction of ellipsoids, figure of equilibrium of a rotating fluid mass, three hours. — By Professor C. SEGRE: General survey of concepts and methods in modern geometry, three hours. — By Professor C. SOMIGLIANA: General theory of elasticity, three hours.

PROFESSOR H. POINCARÉ has retired from the professorship of astronomy at the Ecole polytechnique with the title of honorary professor.

AT the University of Toulouse, Professor E. COSSERAT has, at his own request, been transferred to the department of astronomy. Professor J. DRACH, of the University of Poitiers, has been appointed his successor as professor of mathematics.

DR. L. BRICARD, of the Ecole polytechnique, has been appointed professor of mathematics in the conservatory of arts and measures, of Paris, as successor to Professor Lausedat.

DR. G. SANNIA has been appointed docent in geometry at the University of Turin.

DR. G. SCORZA has been appointed docent in projective geometry at the University of Bologna.

PROFESSOR M. ABRAHAM, of the University of Göttingen, has been appointed professor of mathematical physics at the University of Illinois.

DR. A. E. YOUNG, of Purdue University, has been appointed professor of mathematics at Miami College, Oxford, Ohio.

PROFESSOR C. O. GUNTHER, of Stevens Institute, has been promoted to a full professorship of mathematics at the same institution.

MR. E. H. COMSTOCK has been appointed assistant professor of mathematics at the University of Minnesota.

DR. J. H. McDONALD, of the University of California, has been promoted to an assistant professorship of mathematics.

PROFESSOR O. BOLZA, of the University of Chicago, has been granted leave of absence for the next academic year, which he will spend in Europe.

PROFESSOR J. W. YOUNG, of Princeton University, has been appointed assistant professor of mathematics at the University of Illinois.

AT Princeton University, Drs. C. E. STROMQUIST, J. G. HUN, and C. R. MACINNES have been promoted to assistant professorships of mathematics. Dr. JOHN IRWIN has been appointed instructor in mathematics.

DR. C. N. MOORE has been appointed instructor in mathematics at the University of Cincinnati.

AT the University of Wisconsin, Mr. R. T. CRAIGS has been appointed instructor in mathematics in the university extension department.

MR. W. E. MACDONALD, of the Massachusetts Institute of Technology, has been appointed instructor in mathematics at Harvard University.