faces of negative curvature,* although even of this, were any one to dispute it, there is probably no extant evidence which would be available in a court of law.

MORRISTOWN, *February* 18, 1893.

## NOTES.

A REGULAR meeting of the NEW YORK MATHEMATICAL SOCIETY was held Saturday afternoon, February 4, at half-past three o'clock, the president, Dr. McClintock, in the chair. The following persons, having been duly nominated and being recommended by the council, were elected to membership: Professor Heinrich Maschke, University of Chicago; Lieutenant C. De Witt Willcox, U. S. A., U. S. Military Academy, West Point; Mr. J. N. James, U. S. Naval Observatory, Washington; Mr. Abraham Cohen, Johns Hopkins University. The council announced the adoption of the following resolution: "That any member of the society in good standing who is connected with an educational institution may order one extra copy of the BULLETIN for the use of such institution at the price of $2.50 a year."

Professor Thomas Craig read a paper entitled "Some of the developments in the theory of ordinary differential equations between 1878 and 1893." This paper appears in the present number of the BULLETIN, p. 119.

Dr. McClintock mentioned his having recently devised the following continued products, wherein $y = x - x^2$:

$$\frac{\sin(x\pi)}{\pi} = y(1+y)\left(1+\frac{y^2}{2^2[1+y]}\right)\left(1+\frac{y^2}{3^2[2+y]}\right)\cdots\left(1+\frac{y^2}{r^2[r-1+y]}\right)\cdots$$

$$= y\frac{2+y}{2-y}\left(1-\frac{y^2}{2^2[3-y]}\right)\left(1-\frac{y^2}{3^2[4-y]}\right)\cdots\left(1-\frac{y^2}{r^2[r+1-y]}\right)\cdots$$

$$= x\frac{1-x^2}{1+x^2}\left(1+\frac{x^2-x^4}{1.2[2+x^2]}\right)\left(1+\frac{x^2-x^4}{2\,3[3+x^2]}\right)\cdots\left(1+\frac{x^2-x^4}{r[r-1][r+x^2]}\right)\cdots$$

If $x = \frac{1}{2}$, these become

$$\frac{1}{\pi} = \frac{5}{16}\left(1+\frac{1}{4^2.5}\right)\left(1+\frac{1}{6^2.9}\right)\cdots = \frac{5}{16}\left(1+\frac{1}{80}\right)\left(1+\frac{1}{324}\right)\cdots$$

$$= \frac{1}{4}\cdot\frac{1^2.5}{2^2.1}\cdot\frac{3^2.9}{4^2.5}\cdot\frac{5^2.13}{6^2.9}\cdots = \frac{9}{28}\left(1-\frac{1}{4^2.11}\right)\left(1-\frac{1}{6^2.15}\right)\cdots$$

$$= \frac{9}{28}\left(1-\frac{1}{176}\right)\left(1-\frac{1}{540}\right)\cdots = \frac{1^2}{3}\cdot\frac{3^2.3}{2^2.7}\cdot\frac{5^2.7}{4^2.11}\cdots$$

$$= \frac{3}{10}\left(1+\frac{1}{24}\right)\left(1+\frac{1}{104}\right)\left(1+\frac{1}{272}\right)\left(1+\frac{1}{560}\right)\left(1+\frac{1}{1000}\right)\cdots$$

* Riemann hat freilich schon 1854 die Beziehung sehr wohl gekannt." —Klein, Vorlesung, i. 191.

Proof as to each is had by dividing each factor by the corresponding factor of the well-known expression

$$\frac{\sin(x\pi)}{\pi} = x(1 - x^2)\left(1 - \frac{x^2}{2^2}\right) \ldots \left(1 - \frac{x^2}{r^2}\right) \ldots,$$

the quotient in each case forming a continued product readily proved equal to unity.

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# NEW PUBLICATIONS.

## I. HIGHER MATHEMATICS.

AMIGUES (E.). La théorie des ensembles et les nombres incommensurables. Paris, Masson, 1892. 4to. 10 pp.

ANDRÉIEV (K. A.). Zbornik zadach po analiticheskoi geometrii. (Collection of problems in analytic geometry.) Kharkov, 1892. 8vo. (Russian.) Mk. 5.00

BOHLMANN (G.). Über eine gewisse Classe continuirlicher Gruppen und ihren Zusammenhang mit den Additionstheoremen. Halle, 1892. 4to. 31 pp.

CAYLEY (A.) Collected mathematical papers. (In 10 vols.) Vol. V. Cambridge University Press, 1892. 4to. Half parchment. 25s.

FORSYTH (A. R.). Theorie der Differentialgleichungen. Theil I: Exacte Gleichungen und das Pfaff'sche Problem. Autorisirte deutsche Ausgabe von H. Maser. Leipzig, Teubner, 1893. 8vo. 12 and 378 pp. Mk. 12.00

KATALOG mathematischer und mathematisch-physikalischer Modelle, Apparate und Instrumente. Im Auftrage der deutschen Mathematiker-Vereinigung herausgegeben von W. Dyck. München, Dyck, 1892. 8vo. 16 and 430 pp. fig. Mk. 9.80

LOBATTO. Lessen over de hoogere Algebra. 4ter druk, bewerkt door A. E. Rahusen. Sneek, 1892. 8vo. 4 and 455 pp.

MAILLET. Recherches sur les substitutions et en particulier sur les groupes transitifs. Paris, 1892. 4to. 125 pp. Fr. 6.50

STEGEMANN (M.). Grundriss der Differential- und Integral-Rechnung. 6te, vollständig umgearbeitete und vermehrte Auflage, herausgegeben von L. Kiepert. Theil I: Differential-Rechnung. Hannover, 1892. 8vo. Mk. 12.00

———. Tabelle der wichtigsten Formeln aus der Differential-Rechnung. 6te Aufl., herausgegeben von L. Kiepert. Hannover, 1892. 8vo. 27 pp. Mk. 0.50

TANNERY (J.) ET MOLK (J.). Éléments de la théorie des fonctions elliptiques. (In 4 vols.) Vol. I: Introduction; calcul différentiel (1 re partie). Paris, Gauthier-Villars, 1893. 8vo. Fr. 7.50

## II. ELEMENTARY MATHEMATICS.

BLACKIE'S Algebra for beginners. 12mo. London, Blackie, 1892. 6s.

BLACKIE'S Euclid and mensuration for beginners. 12mo. London, Blackie, 1892. 6s.