

in observation), make the transformation  $x = \pm \frac{s}{\sqrt{2}} (1 + i)$ , where  $i = \sqrt{-1}$ , and it is readily found that  $\frac{1}{\sqrt{2}} \int_0^\infty e^{-x^2} dx = \int_0^\infty \sin s^2 ds = \int_0^\infty \cos s^2 ds = \pm \frac{1}{2} \sqrt{\frac{\pi}{2}}$ , integrals studied by Euler as early as 1781.\* Now if we consider Jacob Bernoulli's problem,† to determine the curve whose curvature is proportional to its arc, we are led (on taking the constant of proportion as unity) to the equations

$$x = \int_0^s \sin s^2 ds, \quad y = \int_0^s \cos s^2 ds$$

which define a double spiral curve,‡ turning about the asymptotic points, determined by the Euler integrals above, and hence named by Cesàro the Clothoide.§ It would also be interesting to remark that the curve is associated with the name of Fresnel, who was led to it in discussing the diffraction of light.||

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### SHORTER NOTICES.

*Archimedis Opera Omnia.* Volume II. By J. L. HEIBERG. Leipzig, B. G. Teubner, 1912. xviii + 554 pp. 8 Marks.

It may seem strange that a new Latin-Greek edition of the works of Archimedes should be deemed necessary, the first one under the editorship of Professor Heiberg having appeared as late as 1880-1881. We expect new translations into modern

\* "De valoribus integralium variabilis  $x = 0$  usque  $x = \infty$  extensorum." "M. S. Academiae exhib. d. 30 Aprilis, 1781." Euler here evaluates the integrals by means of gamma functions. Published in *Inst. Calculi Integr.* IV (1794), pp. 339-345.

† "Invenire curvam cujus curvado in singulis punctis est proportionalis longitudini arcus; id est, quae ab appenso pondere flectitur in rectam," *Opera*, Geneva, 1774, vol. 2, pp. 1084-1086.

‡ Cf. Picard, *Traité d'Analyse*, tome 1, 2<sup>e</sup> ed., 1901, p. 357.

§ *Nouv. Ann. Math.* (3), vol. 5 (1886), p. 512.

|| *Œuvres complètes*, tome I, p. 319, Paris, 1866; "Mémoire sur la diffraction de la lumière," presented to the Academy of Sciences in 1818, crowned in 1819 and first published in 1826. *Mém. de l'Acad. Fran.*, tome V, for 1821-22, Paris, 1826.