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have added to it the curious artifices which he has utilised in his researches for the purpose of exhibiting sums of p^{th} powers as a p^{th} power in the cases $p = 4, 5$, and even 6 ."

381. [I. 17.] No. 99, vol. vi., July 1912, p. 338, Note 373. Identity (v) does not hold for $x = 1$. What is the correct form? E. N. BARISIEN.

QUERIES.

(83) In an ordinary pack of cards, what is the chance that a King and Queen come together? G. N. B.

(84) What is the origin of the sign $\doteq$ denoting "is very nearly equal to"? J. M'WHAN.

REVIEWS.

A B C of Hydrodynamics. By Lieut.-Col. R. DE VILLAMIL, R.E. Pp. 135. 6s. net. 1912. (Spon.)

What is hydrodynamics? According to the classification in the 9th edition of the *Encyclopaedia* it is a purely mathematical investigation of the equations of motion (and their integrals) of a purely hypothetical medium called a perfect fluid (sometimes also a viscous fluid), sometimes enclosed in or bounded by surfaces of various forms, such as infinitely long elliptic cylinders or confocal ellipsoids, sometimes containing sources or doublets such as could not possibly be produced experimentally. It really consists, to all intents and purposes, in a study of certain partial differential equations, and it fails to take account of the conditions prevailing in the practical engineering problems associated with town water supply, resistance of ships, screw propellers and aeroplanes. Still the subject is studied by engineering students, probably to their advantage.

According to this definition, Col. De Villamil's book has nothing whatever to do with hydrodynamics, and its title would perhaps have been correct if the author had described it as the A B C of *Hydraulics*. It deals with such questions as the inapplicability of properties of an infinite liquid to liquids of finite extent, the various forms of fluid resistance, such as those due to viscosity, discontinuous motion, vortex motion and eddy formation, and their dependence on the assumed properties of the liquid. The author examines the general conclusions of such writers as Lord Kelvin, Lord Rayleigh, Stokes, Lamb and other theorists in the light of such experiments as those of Osborne Reynolds, Hele Shaw, Poiseuille, Lanchester and others. His book contains no long abstract equations, but rather statements of experimental evidence. While the author evidently holds strong views on the subject, he is very careful to make the book largely a critical discussion of the views of others. A summary of conclusions is given at the end of each chapter. Some of these conclusions will be readily admitted by most people, for example the statement on page 128 that the resistance experienced by moving bodies is chiefly caused by eddy formation. On the other hand, no useful purpose would be served in this review in entering upon a controversy as to whether the mathematician's ideal, "continuous incompressible inviscid infinite liquid," involves contradictions of terms, thus resembling the irresistible body meeting the impenetrable obstacle. There are not very many inducements to a mathematician to try and adapt his work to the requirements of engineers, and if he really wishes to do so he will generally find it better to become an engineer and give up most of his mathematics, relying on the introduction of *constants or coefficients* to save him from running his head against insoluble differential equations. On the other hand, the hypothetical conditions assumed by the mathematician have pretty well done their duty when they have been made use of to write down differential equations, and it may be argued that the inconsistencies of which Col. De Villamil complains do not apply to the equations themselves.

The real difficulty of the position is indeed remarkably simple. As soon as you give up the equations of a medium derived from the assumed definitions of an ideal fluid, you obtain equations of which integrals cannot be found; at least, mathematicians have tried over and over in vain to find them. The same difficulty