SHORTER NOTICES.

An Introduction to the Modern Theory of Equations. FLORIAN CAJORI. New York, The Macmillan Company, 1904. ix + 239 pp.

A VERY clear elementary account of the ordinary theory of equations, including Gauss's 1849 proof that every algebraic equation has a root, is given in pages 1–103. Prior to the algebraic solution of the general cubic C and quartic Q, criteria of the nature of their roots are derived from the equations whose roots are the squares of the differences of every two of the roots of C and Q, respectively.

The usual elementary chapter on substitutions is followed by the elements of substitution groups, including a list of all the substitution groups of degree $\leqq 5$. It would have been instructive to the student to see the elementary proof of this enumeration for degrees $\leqq 4$.

At the end of § 110, the author omits the condition for a series of composition that P_{i+1} is a maximal normal subgroup of P_i. At the bottom of page 125 occurs simple for single.

In the author's presentation of the ideas introductory to the general Galois theory of equations, he has not maintained the usual excellence of his text, although he has avoided the gross errors of certain texts. The fundamental distinction between formal and numerical invariance is relegated to a foot-note! To the author there are just two alternatives, either the coefficients of an equation are all independent variables or are all particular numerical constants. We find the unfortunate statement at the bottom of page 125 that an equation "may represent a more general case when the coefficients are particular numbers than when they are variables." These two cases are merely the opposite extremes of the general case of Galois's theory, a point so obvious that we need not dwell on it further. The same remarks apply to page 2; furthermore, there is no reason why π or e may not enter the coefficients in Galois's theory. If the foot-note on pages 124–5 had been entirely omitted and the statement made that throughout Chapter XI the roots were regarded to be independent variables, so that "unaltered in value" means "formally unaltered," the presentation would be very satisfactory. In fact, the author has closely followed Weber in the presentation of the general Galois theory. There is a trivial discrepancy between § 121 and exercise 2. In § 159 the theorem should be given the