Therefore this form must be the required parametrical representation of *any* oval in tangential coordinates, if we choose the unit of length properly.*

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ON THE CLASS OF DOUBLY TRANSITIVE GROUPS.

BY PROFESSOR W. A. MANNING.

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THE class $u (u > 3)$ of a doubly transitive group of degree n is, according to Bochert,† greater than $\frac{1}{3}n - \frac{2}{3}\sqrt{n}$. If we confine our attention however to those doubly transitive groups in which one of the substitutions of lowest degree is of order 2, it appears that the class is greater than $\frac{1}{2}n - \frac{1}{2}\sqrt{n} - 1$. The proof of this statement rests essentially upon the following

LEMMA. *The degree of a diedral group of class u generated by two non-commutative substitutions of order 2 and degree u is at most $\frac{3}{2}u$.*

Let s and t be the two substitutions in question, and let the order of their product be $N = 2^{\alpha}p_1^{\alpha_1}p_2^{\alpha_2}\cdots p_n^{\alpha_n}$, where p_1, p_2, $\cdots$ are distinct odd primes. The transitive constituents of $\{s, t\}$ may be arranged as follows:

s has m_1 cycles displacing letters not in t, and t has m_2 cycles displacing letters not in s; there are x_i regular constituents of order X_i, with a generator in both s and t (thus common cycles of s and t are explicitly included, while the preceding type of constituent of degree and order 2 is excluded); there are y_j non-regular constituents of degree Y_j and order $2Y_j$, Y_j an odd number; there are y_k' non-regular constituents of degree Y_k' and order $2Y_k'$, Y_k' even, with the generator of degree Y_k' in s, and the generator of degree $Y_k' - 2$ in t; in like manner there are y_k'' constituents of the order Y_k' with $Y_k' - 2$ letters in s and Y_k' letters in t. Since transitive

* Subsequently I have proved that an infinite number of cubes may be circumscribed about an ovoid body. The proof and application of this theorem will be published in the *Science Reports* of the Tôhoku University, Sendai, vol. 3, no. 4.

† Bochert, *Math. Annalen*, vol. 49 (1897), p. 131.