spect to $\mathfrak{F}$ and since for a certain large w, their number exceeds $(w+1)^{\rho-2}$, we conclude that, for a certain large w, Σ_w^ρ does not contain all power products of degree ρ and weight w.

Under our assumption, on the other hand, Σ would contain all differential polynomials of the form $(a_0y+a_1dy/dx+\cdots+a_wd^wy/dx^w)^\rho$, where the a_i are arbitrary elements of $\mathfrak{F}$. It is easily seen that each power product of degree ρ and weight w is a linear combination of certain of these differential polynomials and hence is in Σ_w^ρ. This contradiction shows that for the system $F=y^3=0$ no integer ρ exists or, in other words, differential polynomials G exist having arbitrarily large powers not in Σ.

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NOTE ON THE GALERKIN AND PAPKOVITCH STRESS FUNCTIONS

BY R. D. MINDLIN

1. *Introduction*. H. M. Westergaard* has given a useful interpretation of the Galerkin stress functions† as the components of a vector function satisfying a fourth order equation. From the Galerkin vector, P. F. Papkovitch‡ has developed a new solution of the three-dimensional elasticity equations for a homogeneous, isotropic solid in terms of harmonic functions. The same solution has been given by H. Neuber.§

Some interesting aspects of the Galerkin and Papkovitch functions may be observed when they are approached from a consideration of Helmholtz's theorem. In so doing, it is found that these functions may be reached by a direct analytical process and that they are connected through simple functional rela-

* H. M. Westergaard, this Bulletin, vol. 41 (1935), p. 695.

† B. Galerkin, Comptes Rendus, vol. 190 (1930), p. 1047. See also Todhunter and Pearson, *History of Elasticity*, vol. 2, part 2, pp. 268–270.

‡ P. F. Papkovitch, Comptes Rendus, vol. 195 (1932), pp. 513, 754. J. N. Goodler calls attention to Todhunter and Pearson, loc. cit., vol. 2, part 2, p. 373.

§ H. Neuber, Zeitschrift für angewandte Mathematik und Mechanik, vol. 14 (1934), p. 203.