By the interior is meant all points of the plane which are not on the curve but which are separated from the point $\rho=0$ by the curve. By the exterior is meant all other points of the plane not on the curve nor in the interior of the curve.

THEOREM 3. *If, with the hypothesis of Theorem 2, the 2q radial lines through $\rho=0$ and the roots of $f'(z)$ and midway between the roots are drawn so that the plane is divided into 2q sectors, numbered from 1 to 2q, then either all the roots of $f(z)$ must lie on the radial lines or there must be roots in an odd as well as in an even numbered sector.*

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ON THE REPRESENTATIONS, $N_7(m^2)$[1]

C. D. OLDS

1. **Introduction.** Write $N_r(n)$ for the number of representations of the positive integer n as the sum of r squares, and write $N_r(n, k)$ for the number of representations of n as the sum of r squares in which the first k squares in each representation are odd with positive roots, while the remaining $r-k$ squares are even with roots positive, negative, or zero. In a previous paper the author [5][2] gave an arithmetical derivation of the formula for $N_3(n^2)$. The method used to prove this result was based upon that employed by Hurwitz [2] in his discussion of the analogous formula for $N_5(n^2)$.

In 1930, G. Pall [6] gave an analytical derivation of the formula for $N_7(cn^2)$, c an integer. His formula shows, in particular, that if $m=p_1^{\alpha_1}p_2^{\alpha_2}\cdots p_s^{\alpha_s}$, where $p_1, p_2, \cdots, p_s$ are distinct odd primes, then

$$(1) \qquad N_7(m^2) = 14\prod_{\nu=1}^{s}[p_\nu, \alpha_\nu],$$

where

$$[p_\nu, \alpha_\nu] = \sigma_5(p_\nu^{\alpha_\nu}) - (-1)^{(p_\nu-1)/2}p_\nu^2\sigma_5(p_\nu^{\alpha_\nu-1}).$$

We define the arithmetical function $\sigma_k(n)$, which occurs here, and the function $\rho_k(n)$, which occurs later, by the sums

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[2] The numbers in brackets refer to the bibliography.