

BOOK REVIEW

Algebraische Gleichungen mit reellen oder komplexen Koeffizienten. By Wilhelm Specht. Enzyklopädie der Mathematischen Wissenschaften, Band I, 1, Heft 3, Teil II. Stuttgart, B. G. Teubner Verlagsgesellschaft, 1958. 80 pp. DM 19.

This section of the second edition of the Enzyklopädie seems to be a replacement of the article by C. Runge in the first edition. Entitled *Separation und Approximation der Wurzeln*, Runge's article dealt in part with the theorem of Descartes, Budan-Fourier and Sturm on the number of zeros of a real polynomial on a real interval and with two extensions of the Sturm theorem to the complex domain. But, since Runge's article was printed in 1899 and since most of the material reported in Specht's article was discovered during the present century, there is not too much overlapping between Runge's and Specht's articles.

Though entitled *Algebraic equations*, Specht's article (as it is explained in its introduction) deals with material usually called the "analytic theory of polynomials" or the "geometry of the zeros." As such, it overlaps considerably more the two books:

(I) J. Dieudonné, *La théorie analytique des polynomes*, Memor. Sci. Math. Fasc. 93 (1938).

(II) M. Marden, *The geometry of the zeros of a polynomial in a complex variable*, American Mathematical Society, Mathematical Surveys, no. 3, 1949.

In size (76 pages) it is similar to (I) (70 pages) and like (I), it states results generally without proof and arranges them primarily in an order convenient for reference purposes. This contrasts with (II) which has 183 pages and so attempts to prove most of the results arranging them in an order determined by the methods employed.

While Specht's article reports most of the results stated earlier in (I) and (II), it does have some features which were omitted or were not given as much emphasis in (I) or (II). For instance, it tells about various proofs of the fundamental theorem of algebra and treats the continuity of the zeros at greater length than does (II). Important theorems on symmetric functions of the zeros, quadratic and hermitian forms and Kronecker's method of characteristics are reviewed. Also included are theorems concerning the characteristic roots of matrices, though unfortunately the results due to A. Brauer and Parodi are omitted. Likewise included are theorems on the zeros