105. L. L. Dines: *On linear combinations of quadratic forms.*

The author considers conditions under which $m$ given quadratic forms in $n$ variables admit a linear combination which is (1) definite, or (2) semi-definite. The paper will appear in full in an early issue of Bull. Amer. Math. Soc. (Received December 10, 1942.)

106. H. Schwerdtfeger: *Identities between skew-symmetric matrices.*

Let $P$, $Q$ be two $2m$-rowed skew-symmetric matrices, $P$ regular. Put $P^{-1}Q=A$. The determinant $|\lambda P-Q|$ equals $\kappa(\lambda)^2$ with $\kappa(\lambda)=k_0\lambda^m-k_1\lambda^{m-1}+\cdots+(-1)^m k_m$ where $k_0$, $k_m$ are the pfaffian parameters of $P$, $Q$, respectively, and $k_1, \cdots, k_{m-1}$ the rational simultaneous invariants of $P$ and $Q$. By Cayley's identity one has $\kappa(A)^2=(0)$. By means of known theorems (cf. for example, MacDuffee's *Theory of matrices*, Theorems 32.2, 32.3, and 29.3, or A. A. Bennett, Bull. Amer. Math. Soc. vol. 25 (1919) pp. 455–458) it follows that $\kappa(\lambda)$ has as a factor the highest invariant factor $h(\lambda)$ of $\lambda P-Q$, and thus the minimum polynomial of $A$. Hence follows $h(A)=(0)$ and $\kappa(A)=(0)$. This identity involving the skew-symmetric matrices $P$, $Q$ is of geometric interest; if $m=2$ one has, for instance: $k_0QP^{-1}Q=k_1Q-k_2P$ whence the elementary theory of a pair of null systems (linear complexes) in projective 3-space can be derived. (Received January 8, 1943.)

## Analysis

107. G. E. Albert: *An extension of Korous' inequality for orthonormal polynomials.*

Let $\{q_n(x)\}$ denote the set of polynomials orthonormal on $(a, b)$ with weight functions $p(x)r(x)$ where $0\leqq p(x)$ and $0\leqq r(x)\leqq M$. If a non-negative polynomial $\pi_m(x)$ of degree $m$ can be found such that the quotient $\pi_m(x)/r(x)$ satisfies a Lipschitz condition on $(a, b)$ and if $\{p_n(x)\}$ denotes the set of polynomials orthonormal on $(a, b)$ with weight function $p(x)[\pi_m(x)]^2$ then if the polynomials $\{p_n(x)\}$ are bounded uniformly with respect to $n$ and $x$ on any subset of $(a, b)$ the same is true of the set $\{q_n(x)\}$. This result follows from an inequality that is established by the same procedure as that used on an equiconvergence theorem by L. H. Miller and the author (abstract 49-3-108). If $r(x)$ is bounded from zero and satisfies a Lipschitz condition on $(a, b)$, the inequality mentioned reduces essentially to an inequality due to Korous (G. Szegö, *Orthogonal polynomials*, Amer. Math. Soc. Colloquium Publications vol. 23, 1939, p. 157). (Received January 19, 1943.)

108. G. E. Albert and L. H. Miller: *Equiconvergence of series of orthonormal polynomials.* Preliminary report.

Walsh and Wiener (Journal of Mathematics and Physics vol. 1 (1922)) found necessary and sufficient conditions for the equiconvergence of the expansions of an arbitrary function in terms of different systems of functions orthonormal on a finite interval. In the present paper these conditions are applied to the study of polynomials orthonormal relative to weight functions satisfying a variety of hypotheses. A remarkably simple proof is obtained for an equiconvergence theorem that includes one published by Szegö (*Orthogonal polynomials*, Amer. Math. Soc. Colloquium Publication, vol. 23, 1938, Theorem 13, 1.2) and the results given by Peebles (Proc. Nat. Acad. Sci. U.S.A. vol. 25 (1939) pp. 97–104). The application of the Walsh-Wiener conditions is based upon the observation that if $K_n^{(1)}(x, t)$ and $K_n^{(2)}(x, t)$ are the