385. S. A. Schaaf: *A cylinder cooling problem.*

The temperature distribution is obtained for a heat conducting region consisting of an infinitely long cylinder $0 \leq r < a$ initially at temperature T_0, immersed in an infinite medium $r > a$ composed of a different substance initially at zero temperature, with a contact resistance condition at the interface $r = a$. The Laplace transform is used and, in inverting, it is necessary to show that $D(z) = I_0'(\alpha z)K_0(\beta z) - \lambda I_0(\alpha z)K_0'(\beta z) - \mu z I_0'(\alpha z)K_0'(\beta z)$, where $I_0(z)$ and $K_0(z)$ are Bessel functions and α, β, λ and μ are positive real numbers, does not vanish for $|\arg z| \leq \pi/2$. This is done by considering the integral of $D'(z)/D(z)$ around a contour consisting of two semicircular arcs $|z| = R_1$, R_2 and the segments of the imaginary axis joining them. (Received September 26, 1946.)

386. Fred Supnick: *Cooperative phenomena.* I. *Structure of the linear Ising model.*

The partition function $f(T)$ (the physical term) plays an important part in the theory of crystal statistics (cf. C. H. Wannier, Review of Modern Physics (1945) pp. 50–60). Let the set of spins $u_1, \cdots, u_n$ each capable of two orientations be characterized by $u_i = +1$ or $u_i = -1$, and arranged in cyclic order. It is assumed that only adjacent elements interact. To evaluate $f(T)$ the interaction energy E must be found. E involves the calculation of $\Sigma \equiv \sum_{i=1}^{n} u_i u_{i+1}$ where $u_{n+1} \equiv u_1$. All spin distributions are considered in evaluating $f(T)$. The author calls Σ the interaction constant of the spin distribution. Now, let Σ_i be any integer with $|\Sigma_i| \leq n$. In this paper the set of all possible spin distributions with interaction constants equal to Σ_i is determined. A method is given for constructing each spin distribution with $\Sigma = \Sigma_i$. Results involving the number of spin distributions with the same interaction constant are obtained. Both cyclic and non-cyclic cases are considered. (Received September 28, 1946.)

Geometry

387. Germán Ancochea: *Zariski's proof of the theorem of Bertini-Enriques in the case of an arbitrary ground field.*

Zariski (Trans. Amer. Math. Soc. vol. 50 (1941)) gave a new proof of the theorem of Bertini-Enriques on reducible linear systems of V_{r-1}'s on an algebraic V_r, by considering this theorem in a larger sense than the customary since irrational pencils are also included. The proof, given for the case of ground fields of characteristic zero, is based on several lemmas concerning the behavior, with respect to irreducibility, of an algebraic variety under ground field extensions. Most of these lemmas have been extended by Chevalley to the case of arbitrary ground fields (Trans. Amer. Math. Soc. vol. 55 (1944)). In the present paper the theorem of Bertini-Enriques, in the sense of Zariski, is extended to ground fields of characteristic $p \neq 0$. The auxiliary lemmas are reconsidered from a different standpoint than that of Chevalley, by using the Chow-van der Waerden concept of an associated form of an algebraic variety. It also has been found necessary to incorporate in Zariski's definition of an irreducible pencil on V_r the extra requirement that the field of functions on V be separably generated over the ground field. With these changes the theorem of Bertini-Enriques is proved essentially as in Zariski's paper, provided that the ground field be an infinite field for the case of linear systems. (Received August 2, 1946.)