315. L. B. Robinson: *Some complete systems of semitensors.*

The first problem is to find a complete system of semitensors of order one associated with the system of linear homogeneous differential equations (A) $y_i'' + \sum_{j=1}^{3} p_{ij}y_j' + \sum_{j=1}^{3} q_{ij}y_j = 0\ (i=1, 2, 3)$. The semitensors are transformed thus: $\bar{I} = \Delta_{1i}I_1 + \Delta_{2i}I_2 + \Delta_{3i}I_3$ where the Δ_{ji} are minors of the determinant of the transformation. Write $V_i \equiv D_{i1}I_1 + D_{i2}I_2 + D_{i3}I_3 = f_i$, in which the D_{ij} are minors of the determinant $|Z\ Y\ y|$ and the f_i arbitrary functions of the covariants of A. Solve with respect to the I_j and the complete system of semitensors results. To get semitensors of the second order, write $W_{ij} \equiv V_i \cdot V_j = f_{ij}$, wherein f_{ij} is an arbitrary function of the covariants, assume $I_iI_j \equiv I_{ij} \equiv I_{ji}$, solve with respect to I_{ij} and the complete system of semitensors is obtained. (Received April 7, 1941.)

316. W. J. Trjitzinsky: *Singular Lebesgue-Stieltjes integral equations.*

Integral equations, involving Stieltjes integrals, have been studied by a number of authors and, quite extensively, by N. Gunther. The kernels considered by Gunther are sufficiently "regular" to secure results resembling those of Fredholm and in the case of "symmetry," suitable defined, resembling those of Schmidt. The present work develops comprehensive theories of several types of integral equations, involving "symmetric" kernels essentially more general than those of Gunther; the kernels of the present work are representable as limits, in a suitable sense, of "regular" kernels. Our theory is based on Lebesgue-Stieltjes (Radon) integration, which appears to be an appropriate (in fact, necessary) tool for such problems. The developments are not of Fredholm type and they involve, in a very essential way, the use of an appropriate spectral theory. (Received April 3, 1941.)

Applied Mathematics

317. K. O. Friedrichs: *On the mathematical theory of the buckling of spherical shells.*

This paper is a contribution to von Kármán's recent nonlinear theory of buckling of spherical shells. The physically important state of equilibrium corresponds to a stationary value of the energy functional which is not a minimum but is of a degenerate character (no type number). The fact that buckling occurs only in the vicinity of one point is explained as a boundary layer phenomenon. For the analysis of the problem the Ritz method is employed. (Received April 2, 1941.)

318. F. G. Gravalos: *The algebraic integrals of Hill's equations.*

Hill's equations are $x'' - 2y' = 3x - \mu x/r^3$, $y'' + 2x' = -\mu y/r^3$, $r = (x^2+y^2)^{1/2}$, μ a parameter. Such a system of differential equations admits of Jacobi's integral $\frac{1}{2}(x'^2+y'^2) - \frac{3}{2}x^2 - \mu/r = c$. In this paper the theorem is proved: All the algebraic integrals of Hill's equations are functions of Jacobi's integral. The proof is done by parts in the form of three theorems. First, it is proved that all the integrals in the field $\Gamma(x', y', x, y, r)$ are reducible from Jacobi's. Second, the existence of integrals containing t rationally is ruled out. Finally, the above theorem is proved. Some parts of the proof are the same as those in a paper by C. L. Siegel on the restricted problem of three bodies (Transactions of this Society, vol. 39 (1936), pp. 225–237). (Received April 8, 1941.)