lem is thereby reduced to one of the determination of branch points of a system of nonlinear equations by means of a characteristic value problem for a system of linearized equations. The relations between $\delta \boldsymbol{M}$, $\delta \boldsymbol{N}$ and $\delta \boldsymbol{r}$ are, for an elastic shell, those following from Hooke's law and from Navier's hypothesis. The complete system of scalar equations of this problem is obtained by a method analogous to that employed by the author in his simplified derivation of the equations for small displacements of thin shells (American Journal of Mathematics, vol. 63 (1941), pp. 177–184). (Received July 28, 1941.)

416. Alexander Weinstein: *On the buckling of a rectangular clamped plate compressed in one direction.*

This problem can be solved by an extension of a general method of reduction of eigenvalue problems (A. Weinstein, Mémorial des Sciences Mathématiques, vol. 88 (1937)). It can be linked to the corresponding problem for a supported plate by a sequence of intermediate differential problems of the fourth order which give lower bounds for the eigenvalues. It follows from this method that the lowest eigenvalue for a square plate of area π^2 is >10.0 while an upper bound 10.4 has been computed by J. L. Maulbetsch (Journal of Applied Mechanics, vol. 49 (1937)) who used the Rayleigh-Ritz method. The present method which gives definitely lower bounds for all eigenvalues differs essentially from previous formal procedures which could not establish such results. (Received July 18, 1941.)

Geometry

417. E. F. Allen: *On a triangle inscribed in a rectangular hyperbola.*

In the study of inversive geometry the following formulas: $z\bar{z}=a^2$, $a^2z+t_1t_2\bar{z}=a^2(t_1+t_2)$, $a^2z+t_1^2\bar{z}=2a^2t_1$, $\bar{p}z+p\bar{z}=2a^2$ are respectively the self-conjugate equation of a circle, the equation of a line through two points on the circle, the equation of the tangent line, and the equation of the polar line of the point p with respect to the circle, where $z=x+iy$, $\bar{z}=x-iy$, and i is defined by the equation $i^2=-1$. If a point in the xy-plane is designated by $z=x+ry$, $\bar{z}=x-ry$, and r is defined by the equation $r^2=+1$, the base $z\bar{z}=a^2$ is the rectangular hyperbola $x^2-y^2=a^2$. It is proved that the above formulas hold. They still hold if r is defined by $r^2=-k$ or $r^2=+k$, where k is a real number. For any triangle inscribed in a rectangular hyperbola there exists a nine-point hyperbola having many of the characteristics of the nine-point circle of a triangle. An anti-orthocentric group of triangles is defined and it is proved that the four triangles of the group have a common nine-point hyperbola. (Received July 17, 1941.)

418. E. F. Beckenbach: *On the analytic prolongation of a minimal surface.*

In extension of a known result concerning the interior behavior of minimal surfaces, it is shown that if a minimal surface is bounded in part by a plane curve and if the surface approaches the plane orthogonally, then the surface can be extended analytically across the plane and the plane is a plane of symmetry for the extended minimal surface. (Received August 2, 1941.)

419. Nathaniel Coburn: *Semi-analytic unitary subspaces of unitary spaces.*

Suppose a Hermitian space X_m of m-dimensions is imbedded in an n-dimensional