203. A. M. Gelbart: *Bounds for pressure in a two-dimensional flow of an incompressible perfect fluid.*

It is known that the problem of the pressure distribution along a wing in the case of a two-dimensional flow of an incompressible perfect fluid can be reduced to the problem of determining the function which maps the exterior domain into the exterior of a circle. This paper deals with some properties of the function in the neighborhood of the angle of the wing. Bergman treats this problem by employing orthogonal functions and certain special transformations. (See abstract 48-5-200.) Using this approach, some inequalities previously obtained by the author for the coefficients of the mapping function, and a minimum integral, inequalities for the velocity in the neighborhood of the angle are obtained which depend only upon a suitable domain in which the boundary of the profile lies. (Received March 7, 1942.)

204. W. A. Mersman: *Heat conduction in a finite composite solid.*

The problem of one-dimensional heat conduction in a composite wall has been solved by Churchill (Duke Mathematical Journal, vol. 2 (1936), pp. 405–414, and Mathematische Annalen, vol. 115 (1938), pp. 720–739), the solution being presented in the form of a series which converges rapidly for large time values. The present paper furnishes a transformation of Churchill's solution in the form of a series which converges rapidly for small time values. This is done by expanding the Laplace transform of the solution as a geometric series and inverting term-by-term, instead of applying the Mittag-Leffler theorem and the inversion theorems of Doetsch and Churchill. (Received February 19, 1942.)

205. W. A. Mersman: *Heat conduction in an infinite composite solid with an interface resistance.*

The problem of one-dimensional heat conduction in a doubly infinite composite solid with an interface resistance is solved by the Laplace transformation method. The interface conditions are: (1) the product of conductivity and temperature gradient is continuous across the interface; (2) the temperature discontinuity across the interface is proportional to the product in (1) above, the factor of proportionality being a constant. (Received February 9, 1942.)

Geometry

206. Herbert Busemann: *Spaces with convex spheres.*

In a metric space a continuous curve which is locally isometric with a euclidean straight line will be called a geodesic. The paper considers a finitely compact metric space in which there is exactly one geodesic through any two different points. With an obvious definition of a tangent of a sphere a sphere is called convex if no tangent of the sphere contains interior points of that sphere. Assume that all spheres are convex and that the space has dimension greater than or equal to 3. The space is congruent to an elliptic space, as soon as at least one geodesic is closed. If all geodesics are open, convexity of the spheres as defined above coincides with the usual idea that a segment whose end points are in a sphere lies completely in the sphere, but the space is not necessarily flat. However if the parallel axiom (properly formulated) holds, the space is flat and its metric is Minkowskian. (Received March 20, 1942.)

207. Aaron Fialkow: *Conformal differential geometry of a subspace.*

In previous papers and abstracts, the author has shown that a conformal differentiation process may be defined with respect to an arbitrary subspace V_n in any Riemann space V_m $(0<n<m;\ m>2)$. By means of this tool, the conformal fundamental forms of V_n, which completely characterize its conformal geometry, were discovered as well as the fundamental differential equations which the coefficients of these forms satisfy. The conformal differential geometry of V_n based upon these forms and upon the conformal differentiation process is now developed. As in classical differential geometry, it includes the conformal analogues of normal and geodesic curvature, conjugate and asymptotic directions, developables and spaces of constant curvature, and so on. Classical theorems such as those of Meusnier, Euler and others hold in this geometry. However, some completely new geometric theorems are derived which are based on tensors having no analogue in the classical theory. Many results of a special character (particularly if $n=2$) are obtained. Some important special conformal coordinate systems are indicated. (Received March 5, 1942.)

208. L. C. Hutchinson: *On the linear line complex in n-space.*

This paper starts from certain contradictions in the literature and from the careful distinction between two closely related, but not identical concepts, a bivector and its associated $(n-2)$-complex, and develops the general theory employing tensor methods. (Received March 7, 1942.)

209. A. D. Michal: *A theory of fluctuations in Riemannian spaces.* Preliminary report.

This paper deals with parallel displacement and differential invariants of multiple point correlation tensor fields in n-dimensional Riemannian geometry. (Received March 14, 1942.)

210. Don Mittleman: *Spin in newtonian mechanics.*

Newtonian mechanics has not considered the possibility of attributing spin properties to point particles moving in a general positional field of force. However, this may be done and the appropriate equations are obtained by considering the limiting form of the equations of motion of a rigid body of finite dimensions as the maximum diameter of the body approaches zero. The result is dependent on the limit of the ratio of the principal moments of inertia, but to fix the limit it is assumed that the ratio of the principal axes of the ellipsoid of inertia approaches one. For a particle, the trajectory is no longer a curve but a series of elements. The geometry of the trajectorial series is investigated. The program is repeated for infinitesimal rods. (Received February 2, 1942.)

211. T. W. Tomlinson: *Geometry of linear fractional polygenic functions.*

Linear fractional functions of $z=x+iy$ and $\bar{z}=x-iy$ are studied in detail. Any such correspondence T can be factored into a Moebius transformation followed by a projectivity. In general T possesses one point f_1 of direct conformality and one point f_2 of reverse conformality. The Kasner circles corresponding to the points of the perpendicular bisector of f_1f_2 pass through the origin and their centers are on a circle through the origin. (Received March 20, 1942.)

212. C. B. Tompkins: *Local imbedding of Riemannian spaces.*

The paper gives a proof of Janet's theorem on local imbedding of an n-dimensional Riemannian space in euclidean space of $n(n+1)/2$ dimensions. The proof is by induction on the number of dimensions, and the induction is made possible by strengthening the theorem slightly to state that the Riemannian space can be imbedded so that its tangent plane and the vectors obtained by differentiating the imbedding functions twice with respect to a set of $(n-1)$ of the n parameters of the Riemannian space together span the euclidean space. The proof involves an existence theorem in differential equations, a warping process somewhat analogous to the process of rolling a plane into a cylinder, and an algebraic lemma which is used to show that the warping process will furnish the independence of vectors required in the strengthened theorem of the inductive proof. (Received March 20, 1942.)

213. B. J. Topel and P. M. Pepper: *Imbedding theorems under weakened hypotheses.*

The congruent imbedding of a semi-metric space into E_n, the euclidean n-space, as implied by the imbeddability of as few as possible of its $(n+2)$-tuples is considered. For S, consisting of $n+4$ or more points, to be imbeddable into E_n, but not E_{n-1}, it is necessary and sufficient that S contain a certain nucleus S' and that all $(n+2)$-tuples containing at least n points of S' be imbeddable. Sufficient conditions are derived for the imbeddability of S when an upper bound is placed on the number of non-mapping $(n+2)$-tuples with no restriction on their distribution in S. These theorems sharpen Menger's quasi-congruence theorem. Necessary and sufficient conditions are determined for the imbeddability of a semi-metric space into E_n. Similar theorems are considered for imbeddability into an element of any congruence system. The structure of non-mapping sets with the minimum number of non-mapping $(n+2)$-tuples is studied. (Received March 23, 1942.)

214. J. E. Wilkins: *A characterization of the quadric of Wilczynski.*

The quadric of Wilczynski at a point P of a non-ruled surface S in projective three-dimensional space is characterized as the unique quadric having second-order contact with S at P (therefore intersecting S in a curve with a triple point at P), the three triple-point tangents being the tangents of Darboux, and the three triple-point osculating planes having a line in common. This line is found to be the canonical line of the first kind with $k=5/12$. (Received March 12, 1942.)

Logic and Foundations

215. S. C. Kleene: *On the forms of the predicates in the theory of constructive ordinals.* Preliminary report.

In the system S_3 of notation for ordinal numbers (Journal of Symbolic Logic, vol. 3 (1938), p. 155), the class O of the natural numbers which represent ordinals, and the partial ordering relation $<_o$ between such numbers, were defined by a transfinite induction. It is now shown that the predicates $a \in O$ and $a <_o b$ are expressible explicitly in the respective forms $(x)(Ey)R(a, x, y)$ and $(x)(Ey)S(a, b, x, y)$ where R and S are primitive recursive predicates. The result can be used to exhibit the incompleteness of ordinal logics by a method presented previously. (See abstract 46-11-464. Erratum: for "for." read "for all.") The proof illustrates a technique to