of the lattice. Conversely, the lattice of subspaces of every projective space is complete, atomic, complemented, and modular. Every irreducible projective space not a projective plane is a coordinate space, and is determined by a division ring and by a cardinal number which may be infinite, namely its dimension. In particular, points, lines, planes and hyperplanes may be added to continuous geometries by the use of lattice ideals. This may permit the introduction of coordinates into continuous geometries by the method of von Staudt. (Received May 11, 1946.)

226. Irving Kaplansky: *Topological rings.*

The paper is devoted to the study of (i) the radical (in the sense of Jacobson, Amer. J. Math. vol. 67 (1945)) of a topological ring, (ii) the structure of compact rings, (iii) rings of functions, (iv) rings of endomorphisms. The radical is closed if the quasi-regular elements are either open or closed, but an example is given of a ring whose radical is not closed. The radical of a compact ring is the union of all (topological) nil ideals. A compact semisimple ring is continuously isomorphic to a complete direct sum of finite simple rings. Compact integral domains are local rings—possibly without chain condition. The ring of functions from a topological space S to a topological ring A is studied; results known when A is the reals or complexes are proved for any simple ring A provided S is totally disconnected. Ideal theory in the ring is also examined. The regular representations of a topological ring and the structure of the ring of continuous endomorphisms of certain topological groups comprise the final section. (Received May 31, 1946.)

227. J. C. C. McKinsey: *On the representation problem for projective algebras.*

C. J. Everett and S. Ulam (*Projective algebra* I, Amer. J. Math. vol. 68 (1946) pp. 77–88) have recently given postulates for projective algebras, and have solved the representation problem for all complete atomic projective algebras. The author shows that every projective algebra is isomorphic to a subalgebra of a complete atomic projective algebra; this result, combined with that of Everett and Ulam, provides a solution of the representation problem for all projective algebras. The method of proof is similar to the method used by M. H. Stone to establish a representation theorem for Boolean algebras. If A is an additive prime ideal, then A_x is defined to be the additive prime ideal which contains all elements of the form a_x, for a in A. If A and B are additive prime ideals, then $A\square B$ is defined to be the class of all additive prime ideals C which contain all elements of the form $a\square b$, where a is in A and b is in B. These definitions are extended in an obvious way so as to permit operations on classes of prime ideals. (Received April 29, 1946.)

Analysis

228. Richard Bellman: *Stability of difference equations.*

Using methods developed in the study of stability of differential equations (cf. the author's paper, *The stability of solutions of linear differential equations*, Duke Math. J. vol. 10 (1943)), the matrix difference equation $X_{n+1}=(A+B)X_n$, where B is a perturbation matrix, is treated, and various hypotheses are made as to the solutions of $X_{n+1}=AX_n$ and the nature of B. Analogues of results of Liapounoff for differential equations are also obtained. (Received April 10, 1946).