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Existence of 2-exceptional Bernstein algebras. (English)

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An algebra A over a field F with a nonzero homomorphism $\omega : A \to F$ is called a baric algebra. A Bernstein algebra is a commutative baric algebra which satisfies $(x^2)^2 = \omega(x)^2 x^2$ for every $x \in A$. Every Bernstein algebra contains a nonzero idempotent e and, if F is a field of characteristic not 2, an associated Peirce decomposition $A = Fe \oplus U \oplus V$ with $\mathrm{Ker}(\omega) = U \oplus V$, $U = \{u \in A \mid 2eu = u\}$ and $V = \{v \in A \mid ev = 0\}$. The ordered pairs $(1+\dim U, \dim V)$ and $(\dim(UV + V^2), \dim U^2)$ are called the type and the subtype of A. A Bernstein algebra $A = Fe \oplus U \oplus V$ is called exceptional of degree n if n is the least non negative integer such that $U(UV^{(n)}) = 0$, where, by induction, $UV^0 = U$ and $UV^{(n)} = (UV^{(n-1)})V$. These definitions do not depend on the choice of the idempotent element.
In the paper under review the authors give an algorithm to construct a 2-exceptional Bernstein algebra of type $(1+r, s)$ and subtype (t, z), where the natural numbers r, s, t, z have to satisfy some algebraic relations. In particular they exhibit a 2-exceptional non nuclear Bernstein algebra of dimension 65, type $(31, 34)$ and subtype $(24, 26)$, and a 2-exceptional nuclear Bernstein algebra of dimension 50, type $(25, 25)$ and subtype $(20, 25)$.

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