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On the multiplication algebra of a Bernstein algebra. (English summary)

The (associative) multiplication algebra $M(A)$ of a Bernstein algebra $A = K e + U + V$ is considered in this paper. It is proved that $M(A)$ has a Peirce decomposition $M(A) = K(2L_e^2 - L_e) + U + V_{11} + V_{01} + V_{10} + V_{00}$, where $2L_e^2 - L_e$ is an idempotent element in $M(A)$ and the other subspaces consist of multiplications that transform $U + V$ into zero, $U$ into $U$ and $V$ into $0$, $U$ into $V$ and $V$ into $0$, $U$ into $0$ and $V$ into $U$, and $U$ into $0$ and $V$ into $V$, respectively.

Well-known properties of Bernstein algebras, such as normality or exceptionality, can be characterized in terms of the above subspaces. So, it is proved that (1) $A$ is exceptional if and only if $V_{01} = 0$, (2) $A$ is normal if and only if $V_{10} = 0$, (3) $U(UV) = 0$ if and only if $V_{00} = 0$.

It is also proved that $\dim M(A) \geq \dim U + 2$ and the algebra $A$ is normal if and only if $\dim M(A) = 2 + 2 \dim U + \dim U^2 - \dim L$, where $L$ denotes the Jordan ideal of $A$, that is, the set of all elements of $U$ that act by multiplication as 0 on an arbitrary element of $U$.

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