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Finite Sums of Vectors in Vector Space

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Summary. We define the sum of finite sequences of vectors in vector space. Theorems concerning those sums are proved.

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The articles [4], [1], [7], [2], [5], [3], and [6] provide the notation and terminology for this paper.

In this paper k denotes a natural number.

Next we state a number of propositions:

(9)[1] Let R be an add-associative right zeroed right complementable Abelian associative left unital distributive non empty double loop structure, a be an element of R, V be an Abelian add-associative right zeroed right complementable vector space-like non empty vector space structure over R, and F, G be finite sequences of elements of the carrier of V. Suppose $\operatorname{len} F = \operatorname{len} G$ and for every k and for every element v of V such that $k \in \operatorname{dom} F$ and $v = G(k)$ holds $F(k) = a \cdot v$. Then $\sum F = a \cdot \sum G$.

(10) Let R be an add-associative right zeroed right complementable Abelian associative left unital distributive non empty double loop structure, a be an element of R, V be an Abelian add-associative right zeroed right complementable vector space-like non empty vector space structure over R, and F, G be finite sequences of elements of the carrier of V. If $\operatorname{len} F = \operatorname{len} G$ and for every k such that $k \in \operatorname{dom} F$ holds $G(k) = a \cdot F_k$, then $\sum G = a \cdot \sum F$.

(13)[2] Let R be an add-associative right zeroed right complementable Abelian associative left unital distributive non empty double loop structure, V be an Abelian add-associative right zeroed right complementable non empty vector space structure over R, and F, G, H be finite sequences of elements of the carrier of V. Suppose $\operatorname{len} F = \operatorname{len} G$ and $\operatorname{len} F = \operatorname{len} H$ and for every k such that $k \in \operatorname{dom} F$ holds $H(k) = F_k - G_k$. Then $\sum H = \sum F - \sum G$.

(21)[3] Let R be an add-associative right zeroed right complementable Abelian associative left unital distributive non empty double loop structure, a be an element of R, and V be an Abelian add-associative right zeroed right complementable vector space-like non empty vector space structure over R. Then $a \cdot \sum(\varepsilon_{(\text{the carrier of } V)}) = 0_V$.

(23)[4] Let R be an add-associative right zeroed right complementable Abelian associative left unital distributive non empty double loop structure, a be an element of R, V be an Abelian add-associative right zeroed right complementable vector space-like non empty vector space structure over R, and v, u be elements of V. Then $a \cdot \sum\langle v, u\rangle = a \cdot v + a \cdot u$.

[1] The propositions (1)–(8) have been removed.
[2] The propositions (11) and (12) have been removed.
[3] The propositions (14)–(20) have been removed.
[4] The proposition (22) has been removed.

(24) Let R be an add-associative right zeroed right complementable Abelian associative left unital distributive non empty double loop structure, a be an element of R, V be an Abelian add-associative right zeroed right complementable vector space-like non empty vector space structure over R, and v, u, w be elements of V. Then $a \cdot \sum\langle v,u,w\rangle = a \cdot v + a \cdot u + a \cdot w$.

(25) Let V be an Abelian add-associative right zeroed right complementable non empty loop structure. Then $-\sum(\varepsilon_{(\text{the carrier of } V)}) = 0_V$.

(27)[5] Let V be an Abelian add-associative right zeroed right complementable non empty loop structure and v, u be elements of V. Then $-\sum\langle v,u\rangle = -v-u$.

(28) Let V be an Abelian add-associative right zeroed right complementable non empty loop structure and v, u, w be elements of V. Then $-\sum\langle v,u,w\rangle = -v-u-w$.

(33)[6] Let V be an Abelian add-associative right zeroed right complementable non empty loop structure and v be an element of V. Then $\sum\langle v,-v\rangle = 0_V$ and $\sum\langle -v,v\rangle = 0_V$.

(34) Let V be an Abelian add-associative right zeroed right complementable non empty loop structure and v, w be elements of V. Then $\sum\langle v,-w\rangle = v-w$ and $\sum\langle -w,v\rangle = v-w$.

(35) Let V be an Abelian add-associative right zeroed right complementable non empty loop structure and v, w be elements of V. Then $\sum\langle -v,-w\rangle = -(v+w)$ and $\sum\langle -w,-v\rangle = -(v+w)$.

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[5] The proposition (26) has been removed.
[6] The propositions (29)–(32) have been removed.