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SOME THEOREMS ON A LOCAL (NONASSOCIATIVE) NEAR-RING

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ABSTRACT. *In this paper we investigate some relations among a local (nonassociative) ring S and its subsets $L, L_d, S \setminus L$ and A, and their associators in S (where $L(L_d)$ is the set of all elements from S which do not have a left (right) inverse in S and A the set of all elements which do not have neither left nor right inverses).*

DEFINITION 1. *A unitary right (nonassociative) near-ring is a nonempty set S with two binary operations: addition $(+)$ and multiplication $(\cdot)$, such that:*

1. *The elements of S form a group $(S,+)$ under addition,*
2. *The elements of S form a groupoid $(S,\cdot)$,*
3. *$\forall x \in S$, $x \cdot 0 = 0$, where 0 is the additive identity of S,*
4. *There exists an element $1 \in S$ such that $1 \cdot s = s \cdot 1 = s$, for all $s \in S$*
5. *$\forall x,\ y,\ z \in S$, $(x+y)\cdot z = x \cdot z + y \cdot z$.*

Let L be the subset of S of all elements without left inverses, i.e. $L = \{l \in S \mid S \neq Sl\}$.

DEFINITION 2. *S is said to be a local near-ring if L is a left S-subgroup* (Df. 2. 1.[2]).

Denote set $S \setminus L$ by U, the set of all elements of S without a right inverse by L_d; the associators: $\{(xy)z - x(yz) \mid x,y,z \in S\}$ of S by $A(S)$, $\{(xs)l - x(sl) \mid l \in L,\ s,x \in S\}$ of L by $A_{rl}(L)$, $\{(sl)x - s(lx) \mid l \in L,\ s,x \in S\}$ of L by $A_{ir}(L)$, $\{(ls)x - l(sx) \mid l \in L,\ s,x \in S\}$ of L by $A_{rr}(L)$, $\{(as)x - a(sx) \mid a \in A,\ s,x \in S\}$ of A by $A_{rr}(A)$, $\{(sa)x - s(ax) \mid a \in A,\ s,x \in S\}$ of A by $A_{ir}(A)$, $\{(xs)l - x(sl) \mid l \in A,\ s,x \in S\}$ of A by $A_{rl}(A)$, $\{(su)v - s(uv) \mid s \in S,\ u,v \in U\}$ by $A_r(U)$, $\{(uv)w - u(vw) \mid u,v,w \in U\}$ of U by $A(U)$, $\{(ks)x - k(sx) \mid k \in L_d,\ s,x \in S\}$ of L_d by $A_{rr}(L_d)$, $\{(sk)x - s(kx) \mid k \in L_d,\ s,x \in S\}$ of L_d by $A_{ir}(L_d)$, $\{(xs)k - x(sk) \mid x,s \in S,\ k \in L_d\}$ of L_d by $A_{rl}(L_d)$, $\{(ul)v - u(lv) \mid u,v \in U,\ l \in L\}$ by $A_{ir}(U)$ and the set of elements in S without a left or a right inverse by A.

LEMMA 1. *Let S be a local near-ring. If $A_r(U)$, $A_{ir}(U) \subseteq L$, then the elements of L do not have right inverses,* (See L. 1[1]).

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PROOF. Suppose that there exists some element l of L with a right inverse l'. Then $ll' = 1 \in U$ contradicts $ll' \in L$. Hence, the elements of L do not have right inverse in L. Let some element $l \in L$ have a right inverse $u \in U$, i.e. $lu = 1$. Since $ul \in L$ then $1 - ul \in U$ and there exists $x \in S$ such that $x(1 - ul) = 1$. As $(1 - ul)u = u - (ul)u = -a$, then $u = (x(1 - ul))u$ and, from here, $(x(1 - ul))u = a_1 + x((1 - ul)u) = a_1 + x(u - (ul)u) = a_1 + x(-a) \in L$, where a, a_1 are the associators of the ordered triples (u, l, u) and $(x, (1 - ul), u)$ respectively. This contradiction establishes the lemma.

THEOREM 1. *Let S be a unitary right (nonassociative) near-ring, and L be a subgroup of $(S,+)$. If $A_{rl}(L) = \{0\}$, then S is local. Conversely, if S is a unitary local near-ring then $A_{rl}(L) \subseteq L$.*

PROOF. If S is a unitary near-ring, L is a subgroup and $A_{rl}(L) = \{0\}$, then S is local. Otherwise, if $sl \notin L$, for some $l \in L$ and some $s \in S$, then $x(sl) = 1$, for some $x \in S$. Since, $(xs)l - x(sl) = 0$, for all $l \in L$ and all $s, x \in S$ and since $x(sl) = 1$, for some $l \in L$ and some $s, x \in S$, then $(xs)l - 1 = 0$ and, from here $(xs)l = 1$, for some $l \in L$ and some $x, s \in S$. This is a contradiction (because $l \in L$). Thus, $sl \in L$, for all $l \in L$ and all $s \in S$, i.e. L is a left S-subgroup and S is, by definition, a local near-ring.

Conversely, if S is a local near-ring, i.e. if $sl \in L$, for all $l \in L$ and all $s \in S$; then $(xs)l - x(sl) \in L$, for all $s, x \in S$ and all $l \in L$, i.e. $A_{rl}(L) \subseteq L$.

THEOREM 2. *Let S be a unitary right (nonassociative) near-ring. If L and $U \cup \{0\}$ are subgroups of $(S,+)$ and $A_{rl}(L) \subseteq L$, then S is local.*

PROOF. If S is a unitary near-ring, L is a subgroup of $(S,+)$ and $A_{rl}(L) \subseteq L$, then S is local. Otherwise, if $sl \notin L$, for some $l \in L$ and some $s \in S$, then $x(sl) = 1$, for some $x \in S$. Since, $(xs)l - x(sl) = a \in L$, for all $l \in L$ and all $x, s \in S$, and since $x(sl) = 1$, for some $l \in L$ and some $s, x \in S$, then $(xs)l - 1 = a$, for some $l \in L$ and some $s, x \in S$. Since $a \in L$, then $(xs)l = a + 1 \in U$, i.e. $(xs)l \in U$ and $(xs)l - 1 \in (U \cup \{0\})$, because $(U \cup \{0\}, +)$ is a group. Thus, $(xs)l - 1 = 0$ and, from here $(xs)l = 1$, for some $l \in L$ and some $y = xs \in S$. This is a contradiction. Thus, $sl \in L$, for all $l \in L$ and all $s \in S$. So, S is a local near-ring.

THEOREM 3. *Let S be a right unitary near-ring, $A_{ir}(L) = \{0\}$, $A_r(U) \subseteq L$ and every element of U has a right inverse. Then, S is a local near-ring if and only if L is a right S-subgroup.*

PROOF. 1° If S is a right unitary near-ring, $A_{ir}(L) = \{0\}$ and L is a right S-subgroup, then S is a local near-ring. Otherwise, if $sl \notin L$, for some $l \in L$ and some $s \in S$, then $(sl)x = 1$, for some $x \in S$. Since, $(sl)x - s(lx) = 0$, for all $l \in L$ and all $x, s \in S$, and since $(sl)x = 1$, for some $l \in L$ and some $s, x \in S$, then $1 - s(lx) = 0$ and. from here, $s(lx) = 1$, for some $s, x \in S$ and some $l \in L$. Since $k = lx \in L$ (by the assumption of this theorem), then $sk = 1$ is a contradiction. So, $sl \in L$, for all $l \in L$ and all $s \in S$, i. e. L is a left S-subgroup. Thus, S is a local near-ring.

2° If S is a right local near-ring, $A_{ir}(L) = \{0\}$ and $A_r(U) \subseteq L$, then L is a right S-subgroup. Otherwise, if $ls \notin L$, for some $l \in L$ and some $s \in S$, then

$x(ls) = 1$, for some $x \in S$. Since $(xl)s - x(ls) = 0$, for all $s, x \in S$ and all $l \in L$, and since $x(ls) = 1$, for some $l \in L$ and some $s, x \in S$, then $(xl)s - 1 = 0$ and, from here, $(xl)s = 1$, for some $l \in L$ and some $s, x \in S$. Since $k = xl \in L$, then $ks = 1$ contradicts L. 1. Thus, $ls \in L$, for all $l \in L$ and all $s \in S$, i. e. S is a right S-subgroup.

THEOREM 4. *Let S be a right unitary local near-ring, $(L, +)$ and $(U \cup \{0\}, +)$ be the subgroups of $(S, +)$ and $A_r(U) \subseteq L$. Then, L is a right S-subgroup if and only if $A_{ir}(L) \subseteq L$.*

PROOF. 1° If S is a unitary local near-ring, $A_{ir}(L) \subseteq L$, L and $(U \cup \{0\}, +)$ are the subgroups of $(S, +)$, then L is a right S-subgroup. Otherwise, if $ls \notin L$, for some $l \in L$ and some $s \in S$, then $x(ls) = 1$, for some $x \in S$. Since $(xl)s - x(ls) = a \in L$, for all $s, x \in S$ and all $l \in L$, and since $x(ls) = 1$, for some $s, x \in S$ and some $l \in L$, then $(xl)s - 1 = a$. Since $a \in L$, then $(xl)s = a + 1 \in U$, i.e. $(xl)s \in U$ and, from here $a = (xl)s - 1 \in (U \cup \{0\})$, because $(U \cup \{0\}, +)$ is a group. Accordingly, $a = (xl)s - 1 = 0$ and, from here, $(xl)s = 1$, for some $l \in L$ and some $s, x \in S$. Since $k = xl \in L$ and $s \in S$, then $(xl)s = 1$ is a contradiction to L. 1. (because $A_{ir}(U) \subseteq A_{ir}(L)$). Thus, $ls \in L$, for all $l \in L$ and all $s \in S$, i.e. L is a right S-subgroup.

2° Conversely, if S is a right local near-ring and if L is a right S-subgroup, then $A_{ir}(L) \subseteq L$. Really, since $sl, ls \in L$, for all $l \in L$ and all $s \in S$, then $(sl)x - s(lx) \in L$, for all $l \in L$ and all $s, x \in S$. Thus, $A_{ir}(L) \subseteq L$.

THEOREM 5. *Let S be a right unitary local near-ring. If $A_r(U)$, $A_{ir}(U) \subseteq L$, $A_{rr}(L) = \{0\}$ and L_d is a left S-subgroup, then $L_d = L$, L and L_d are the right S-subgroups. Conversely, if L_d is a right S-subgroup then $A_{rr}(L)$, $A_{ir}(L) \subseteq L$.*

PROOF. If S is local, $A_r(\mathrm{U})$, $A_{ir}(\mathrm{U}) \subseteq L$, L_d is a left S-subgroup and $A_{rr}(\mathrm{L}) = \{0\}$, then $L_d = L$, L and L_d are right S-subgroups. Otherwise, if $ls \notin L$, for some $l \in L$ and some $s \in S$, then $(ls)x = 1$, for some $x \in S$. From $(ls)x - l(sx) = 0$, for all $l \in L$ and all $s, x \in S$ and from $(ls)x = 1$, for some $l \in L$ and some $s, x \in S$, follows $1 - l(sx) = 0$ and $l(sx) = 1$, for some $l \in L$ and some $s, x \in S$. This is a contradiction to L.1. So, $ls \in L$, for all $l \in S$ and all $s \in S$, i.e. L is a right S-subgroup. Since L is a maximal S-subgroup (Th. 2.[1]) and L_d is a left S-subgroup, then $L_d \subseteq L$. Since the elements of L do not have right inverses (L. 1.), then $L \subseteq L_d$. Thus, $L_d = L$ and L_d is a right S-subgroup.

Conversely, if S is a right local near-ring and L_d is a right S-subgroup then $A_{rr}(L) \subseteq L$. Really, if $sl, ls \in L$, for all $l \in L$ and all $s \in S$, then $(ls)x - l(sx) = a \in L$ and $(sl)x - s(lx) \in L$, for all $l \in L$ and all $s, x \in S$. This means, $A_{rr}(L)$, $A_{ir}(L) \subseteq L$.

THEOREM 6. *Let S be a right unitary local near-ring, $A_r(U)$, $A_{ir}(U) \subseteq L$, $(U \cup \{0\}, +)$ be a subgroup of $(S, +)$ and L_d be a left S-subgroup. Then, $A_{rr}(L) \subseteq L$ if and only if $L_d = L$ and L_d is a right S-subgroup.*

PROOF. 1° If L and L_d are left S-subgroups, $A_r(U)$, $A_{ir}(U)$, $A_{rr}(L) \subseteq L$ and $(U \cup \{0\}, +)$ is a group, then L_d is a right S-subgroup. Otherwise, if $ls \notin L$, for some

$l \in L$ and some $s \in S$, then $(ls)x = 1$, for some $x \in S$. From $(ls)x - l(sx) = a \in L$, for all $l \in L$ and all $s, x \in S$, and from $(ls)x = 1$, for some $l \in L$ and some $s, x \in S$, follows $1 - l(sx) = a$. Since $a \in L$, then $l(sx) = -a + 1 \in U$, i.e. $l(xs) \in U$. So, $a = 1 - l(sx) \in (U \cup \{0\})$, because $(U \cup \{0\}, +)$ is a group. From here, $l(sx) = 1$, for some $l \in L$ and some $s, x \in S$. This is a contradiction to L.1. So, $ls \in L$, for all $l \in L$ and all $s \in S$, i.e. L is a right S-subgroup. Since L is a maximal left S-subgroup (Th. 2. [1]) and L_d (by the assumption of this theorem) is a left S-subgroup then $L_d \subseteq L$. Since the elements of L do not have right inverses (L.1.) then $L \subseteq L_d$. Thus, $L_d = L$ and L_d is a right S-subgroup.

2^o If S is a unitary right local near-ring, $L_d = L$ and L_d is a right S-subgroup then $A_{rr}(L) \subseteq L$. Really, since $L_d = L$ and $ls \in L_d$, for all $l \in L$ and all $s \in S$, then $ls \in L$ and $(ls)x - l(sx) \in L$, for all $l \in L$ and all $s, x \in S$. So, $A_{rr}(L) \subseteq L$.

THEOREM 7. *Let S be a unitary right (nonassociative) near-ring, A and $U \cup \{0\}$ be the subgroups of $(S, +)$, $L_d \subseteq L$ and $A_{rl}(A) \subseteq A$, then A is a left S-subgroup and S is local. Moreover, if A is a right S-subgroup, then $A_{rr}(A) = A_{rr}(L)$, $A_{ir}(A) = A_{ir}(L)$ and $A_{rr}(L_d)$, $A_{ir}(L_d)$, $A_{ir}(A)$, $A_{rr}(A)$, $A_{rr}(L)$, $A_{ir}(L) \subseteq L$.*

PROOF. 1^o If S is a unitary, right near-ring, A and $U \cup \{0\}$ are subgroups of $(S, +)$, $L_d \subseteq L$ and $A_{rl}(A) \subseteq A$ then (by definitions of L_d, L and A and by the assumption, $L = A$, $A \supseteq L_d$), A and L are left S-subgroups. Otherwise, if $sa \notin A$, for some $a \in A$ and for some $s \in S$, then $x(sa) = 1$, for some $x \in S$. Since, by the assumption, $(xs)a - x(sa) = a' \in A$, for all $a \in A$ and all $s, x \in S$, and since $x(sa) = 1$, for some $a \in A$ and some $s, x \in S$, then $(xs)a - 1 = a' \in A$, for some $a \in A$ and some $s, x \in S$. Since $L = A$, then $a, a' \in L$. Since $a' \in A$ then $(xs)a = a' + 1 \in U$,i.e.$(xs)a \in U$ and, from here, $a' = (xs)a - 1 \in (U \cup \{0\})$, because $U \cup \{0\}$ is a group, i.e. $a' \in U \cup \{0\}$. From here, $(xs)a - 1 = 0$, i.e. $(xs)a = 1$, for some $a \in A$ and some $x, s \in S$. This is a contradiction. So, $sa \in A$, for all $a \in A$ and all $s \in S$, i.e. A and L are left S-subgroups. Thus, S is a local near-ring.

Moreover, if A is a right S-subgroup. then from $as, sa \in A$ follows:$\{(as)x - a(sx) \mid a \in A, s, x \in S\}$, $\{(sa)x - s(ax) \mid a \in A,\ s, x \in S\} \subseteq A$. Since $L = A$ and $L_d \subseteq L = A$, then $A_{rr}(A)$, $A_{ir}(A)$, $A_{rr}(L)$, $A_{ir}(L)$, $A_{rr}(L_d)$, $A_{ir}(L_d) \subseteq L$.

COROLLARY 1. *Let S be a unitary right near-ring, $U \cup \{0\}$ and A be the subgroups of $(S, +)$, $L_d \subseteq L$ and $A_{rl}(L_d) \subseteq A$, then $A_{rl}(L_d)$, $A_{rl}(L) \subseteq L$ and $A_{rl}(L) = A_{rl}(A)$.*

PROOF. Since $L = A$, $A_{rl}(L) = A_{rl}(A)$. Since $L_d \subseteq L$ and $A_{rl}(L) = A_{rl}(A) \subseteq L$, $A_{rl}(L_d) \subseteq A_{rl}(L) \subseteq L$, i.e. $A_{rl}(L_d) \subseteq L_d$.

COROLLARY 2. *Let S be a unitary right near-ring, $U \cup \{0\}$ and A be the subgroups of $(S, +)$, $L_d \subseteq L$ and $A_{rl}(A) \subseteq A$, then each element of U has a right inverse.*

THEOREM 8. *Let S be unitary (nonassociative) near-ring, A be a subgroup of $(S, +)$ and $L_d \subseteq L$. If $A_{rl}(A) = \{0\}$, then A is a left S-subgroup and S is local. Conversely, if A is a left S-subgroup or S is local then $A_{rl}(A) \subseteq L$.*

Moreover, if A is a right S-subgroup, then $A_{ir}(A) = A_{ir}(L)$, $A_{rr}(A) = A_{rr}(L)$ and $A_{rr}(A), A_{ir}(A)$, $A_{rr}(L)$, $A_{ir}(L)$, $A_{rr}(L_d)$, $A_{ir}(L_d) \subseteq L$.

PROOF. If S is a unitary right near-ring, A is a subgroup of $(S,+)$, $L_d \subseteq L$ and $A_{rl}(A) = \{0\}$, then A and L are left S-subgroups. Otherwise, if $sa \notin A$, for some $a \in A$ and some $s \in S$, then $x(sa) = 1$, for some $x \in S$. Since $(xs)a - x(sa) = 0$, for all $x, s \in S$ and all $a \in A$, and since $x(sa) = 1$, for some $x, s \in S$ and some $a \in A$, then $(xs)a - 1 = 0$ and, from here, $(xs)a = 1$, for some $a \in A$ and some $x, s \in S$.

Since $L = A$, by definitions of L, A and L_d and by the assumption, $a \in L$. Since $t = xs \in S$ then $(xs)a = 1$ is a contradiction. It means, $sa \in A$, for all $a \in A$ and all $s \in S$, i.e. A and L are left S-subgroups. Thus, S is a local near-ring.

Conversely, if S is a unitary local near-ring or if A is a left S-subgroup and $L_d \subseteq L$, then $A_{rl}(A) \subseteq L$. Really, since $sa \in A$, for all $a \in A$ and all $s \in S$, then $(xs)a - x(sa) \in A$, for all $a \in A$ and all $x, a \in S$. Since $A = L$ then $A_{rl}(A) \subseteq L$.

Moreover, if A is a right S-subgroup, then from $sa, as \in A$, for all $a \in A$ and all $s \in S$, follows: $\{(as)x - a(sx) \mid a \in A,\ s, x \in S\}$, $\{(sa)x - s(ax) \mid a \in A,\ s, x \in S\} \subseteq A$. Since $A = L$ and $L_d \subseteq L$, then $L_d \subseteq A$ and $A_{rr}(A)$, $A_{ir}(A)$, $A_{ir}(L)$, $A_{rr}(L)$, $A_{rr}(L_d)$, $A_{ir}(L_d) \subseteq L$.

COROLLARY 1. *Let S be a unitary right near-ring, A be a subgroup of $(S,+)$, $L_d \subseteq L$ and $A_{rl}(A) \subseteq \{0\}$, then $A_{rl}(L) = A_{rl}(L_d) = \{0\}$.*

PROOF. Since $L = A$, $A_{rl}(L) = A_{rl}(A) = \{0\}$, i.e. $A_{rl}(L) = \{0\}$. Since $L_d \subseteq L$ and $A_{rl}(L) = \{0\}$, $A_{rl}(L_d) = \{0\}$.

COROLLARY 2. *If S is a unitary right near-ring, A a subgroup of $(S,+)$, $L_d \subseteq L$ and $A_{rl}(A) = \{0\}$, then each element of $S \setminus L$ has a right inverse.*

If S is an associative unitary right near-ring then the condition $A_{rl}(A) = \{0\}$ is automatically fulfilled. Moreover, L is a left S-subgroup if and only if L is a subgroup of $(S,+)$. If S is an associative local near-ring then the conditions: $A_{rl}(A) = \{0\}$ ar.d $L_d = L = A$ are automatically fulfilled too (see L. 2. 4[2]).

COROLLARY 3. *Let S be a unitary right (associative) near-ring, $L_d \subseteq L$ and A be a subgroup of $(S,+)$. Then, A is a left S-subgroup and S is local,* (See Th. 2. 5.[2]).

THEOREM 9. *Let S be unitary, right (nonassociative) near-ring, A be a subgroup of $(S,+)$ and $L_d \supseteq L$. Then $A_{rr}(A) = \{0\}$ is a sufficient condition for L_d to be a right S-subgroup. Moreover, if L_d is a left S-subgroup, then S is local.*

PROOF. If S is a unitary right near-ring, $(A,+)$ is a group, $L_d \supseteq L$ and $A_{rr}(A) = \{0\}$, then A is a right S-subgroup and, therefore, L_d is a right S-subgroup. Otherwise, if $as \notin A$, for some $a \in A$ and some $s \in S$, then $(as)x = 1$, for some $x \in S$. Since $(as)x - a(sx) = 0$, for all $a \in A$ and all $s, x \in S$, and since $(as)x = 1$, for some $a \in A$ and some $s, x \in S$, then $1 - a(sx) = 0$ and, from here, $a(sx) = 1$, for some $a \in A$ and some $s, x \in S$. Since $a \in A$, $y = sx \in S$ and since $A = L_d$ (by definitions of L_d and A and by the assumption), then $a(sx) = 1$ is a contradiction. It means, $as \in A$, for all $a \in A$ and all $s \in S$, i.e. A is a right S-subgroup. Since $L_d = A$, then L_d is a right S-subgroup. Since $A \supseteq L$ and $A_{rr}(A) = \{0\}$, $A_{rr}(L) = \{0\}$.

Moreover, if L_d is a left S-subgroup, then S is local. Really, in any case $L \subseteq A$. Since $A = L_d$ is a left S-subgroup then $A \subseteq L$. So, $L = A$, i.e. L is a left S-subgroup. Thus, S is a local near-ring.

COROLLARY 1. *Let S be a unitary right near-ring, A be a left S-subgroup, $L_d \supseteq L$ and $A_{rr}(A) = \{0\}$, then each element of $S \setminus A$ has a right inverse.*

COROLLARY 2. *Let S be a unitary right near-ring, A be a left S-subgroup, $L_d \supseteq L$ and $A_{rr}(A) = \{0\}$, then $A_{rl}(L)$, $A_{ir}(L)$, $A_{rl}(A)$, $A_{ir}(A) \subseteq L$.*

PROOF. Since S is, by Th. 9., local and $L = A$ is a right S-subgroup, then from $sl, ls \in L$, for all $l \in L$ and all $s \in S$, follows $A_{rl}(L)$, $A_{ir}(L)$, $A_{rl}(A)$, $A_{ir}(A) \subseteq L$.

COROLLARY 3. *Let S be a unitary right associative near-ring, A be a subgroup of $(S, +)$. If $L_d \supseteq L$ then L_d is a right S-subgroup. Moreover, if A is a left S-subgroup, then S is local.*

From the proof of Th. 9. follows the next theorem.

THEOREM 10. *Let S be a unitary, right (nonassociative) near-ring and A be a subgroup of $(S, +)$. Then $A_{rr}(A) = \{0\}$ is a sufficient condition for A to be a right S-subgroup. Moreover, if A is a left S-subgroup, then S is local.*

COROLLARY 1. *Let S be a unitary right associative near-ring, and A be a subgroup of $(S, +)$. Then, A is a right S-subgroup.*

REFERENCES

[1] V. VUKOVIĆ, *On Local (Nonassociative) Near-Rings*, Algebra and Logic, Proc. 5th Yugosl. Conf. Cetinje, (1986), 229-237.

[2] C. J. MAXSON, *On Local Near-Rings*, Math. Zeitscher 106, (1968), 197-205.

[3] V. VUKOVIĆ, *(Nonassociative) Near-Ring*, Glasn. Math., Vol. 20(40)(1985), 279-287.

[4] V. PERIĆ AND V. VUKOVIĆ, *On Local (Nonassociative) Near-Rings*, to appear in Glasnik Mathematički

[5] V. VUKOVIĆ, *Some Relations in a Local (Nonassociative) Near-Ring*, to appear in Facta Universitatis.

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