LAGA_chapter06.06problem6.6.1.wxm (LAGA examples)

A test document for Geometric Algebra with wxMaxima
contains...
Initialization
Loading of functions (intrinsic and GA specific)
Pseudoscalar definition (specifies the space dimension) and
calculation of the inverse pseudoscalar used to generate the dual of a multivector
Enumeration of the standard basis for the specified dimension

Blades as Outer Products in the geometric algebra, G4

Initialization

```
(%i36) ext:["wxm"]$
       file_type_maxima:append(ext,file_type_maxima)$
       batchload("initialize_fns")$
```

the pseudoscalar and its inverse
the lowest useable dimension pseudoscalar should be {e1,e2} i.e. Plen = 2
e.g. for four dimensions edit Pseudos:{e1,e2,e3}$ to Pseudos:{e1,e2,e3,e4}$

```
(%i1) Pseudos:{e1,e2,e3,e4}$
      Pvar:listofvars(Pseudos)$
      Plen:length(Pvar)$
      I:Pseudos$
      ni:(Plen-1)*Plen/2$
      Ii:(-1)^ni*I$
      kill(ni)$
      ldisplay(Pvar)$

  (%t8) Pvar=[e1,e2,e3,e4]

(%i9) batchload("initialize_lsts")$

  (%t9) lstblds=[[{e1},{e2},{e3},{e4}],[{e1,e2},{e1,e3},{e1,e4},{e2,e3},{e2,e4},{
e3,e4}],[{e1,e2,e3},{e1,e2,e4},{e1,e3,e4},{e2,e3,e4}],[{e1,e2,e3,e4}]]
 (%t10) allblds=[{e1},{e2},{e3},{e4},{e1,e2},{e1,e3},{e1,e4},{e2,e3},{e2,e4},{e3,
e4},{e1,e2,e3},{e1,e2,e4},{e1,e3,e4},{e2,e3,e4},{e1,e2,e3,e4}]
 (%t11) invblds=[{e1},{e2},{e3},{e4},-{e1,e2},-{e1,e3},-{e1,e4},-{e2,e3},-{e2,e4}
,-{e3,e4},-{e1,e2,e3},-{e1,e2,e4},-{e1,e3,e4},-{e2,e3,e4},{e1,e2,e3,e4}]
```

end of Initialization

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```
(%i12) lstga1:[1]$
       namea1:"a1"$
       makelistgrademv(namea1,lstga1)$
       ldisplay(a1)$
       lstga2:[1]$
       namea2:"a2"$
       makelistgrademv(namea2,lstga2)$
       ldisplay(a2)$
       lstga3:[1]$
       namea3:"a3"$
       makelistgrademv(namea3,lstga3)$
       ldisplay(a3)$
       lstga4:[1]$
       namea4:"a4"$
       makelistgrademv(namea4,lstga4)$
       ldisplay(a4)$

 (%t15) a1=a1_1,4*{e4}+a1_1,3*{e3}+a1_1,2*{e2}+a1_1,1*{e1}
 (%t19) a2=a2_1,4*{e4}+a2_1,3*{e3}+a2_1,2*{e2}+a2_1,1*{e1}
 (%t23) a3=a3_1,4*{e4}+a3_1,3*{e3}+a3_1,2*{e2}+a3_1,1*{e1}
 (%t27) a4=a4_1,4*{e4}+a4_1,3*{e3}+a4_1,2*{e2}+a4_1,1*{e1}
```

unused coefficients of vector b

```
(%i28) lstgb:[1]$
       nameb:"b"$
       makelistgrademv(nameb,lstgb)$
       ldisplay(b)$

 (%t31) b=b_1,4*{e4}+b_1,3*{e3}+b_1,2*{e2}+b_1,1*{e1}
```

redefinition of vector b...
vector b is a sum of (scalar xi times vector ai) for i=1,4

```
(%i32) b:x1*a1+x2*a2+x3*a3+x4*a4$
       ldisplay(b)$
       b:facsum(b,allblds)$
       ldisplay(b)$

 (%t33) b=(a4_1,4*{e4}+a4_1,3*{e3}+a4_1,2*{e2}+a4_1,1*{e1})*x4+
(a3_1,4*{e4}+a3_1,3*{e3}+a3_1,2*{e2}+a3_1,1*{e1})*x3+
(a2_1,4*{e4}+a2_1,3*{e3}+a2_1,2*{e2}+a2_1,1*{e1})*x2+
(a1_1,4*{e4}+a1_1,3*{e3}+a1_1,2*{e2}+a1_1,1*{e1})*x1
 (%t35) b={e4}*(a4_1,4*x4+a3_1,4*x3+a2_1,4*x2+a1_1,4*x1)+{e3}*
(a4_1,3*x4+a3_1,3*x3+a2_1,3*x2+a1_1,3*x1)+{e2}*
(a4_1,2*x4+a3_1,2*x3+a2_1,2*x2+a1_1,2*x1)+{e1}*
(a4_1,1*x4+a3_1,1*x3+a2_1,1*x2+a1_1,1*x1)
```

Problem 6.6.1b
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```
(%i36) lst:[a1,a2,a3,a4]$
       lhs:x2*list2vecouter(lst)$
       lst:[a1,b,a3,a4]$
       rhs:list2vecouter(lst)$
       is(equal(lhs,rhs))$
       ldisplay(%)$

 (%t41) %=true
```