LAGA_chapter06.04.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

The Dual in the geometric algebra, G3

Reference book...Linear and Geometric Algebra (LAGA)
by Alan Macdonald

Initialization

```
(%i26) 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}$
      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]

(%i9) batchload("initialize_lsts")$

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

end of Initialization

Exercise 6.13
page 105

orthonormal bases with opposite orientations using both functions
bladep() and geomp() in the subspace G2

```
(%i12) {e1}~*{e2}$
       ldisplay(%)$
       {e1}&*{e2}$
       ldisplay(%)$

(%t13) %={e1,e2}
(%t15)/R/ %={e1,e2}

(%i16) fpprintprec:4$
       b1:1/sqrt(2)*({e1}+{e2})$
       b2:1/sqrt(2)*({e1}-{e2})$
       b1&*b2$
       expand(ev(%,numer))$
       ldisplay(%)$

(%t21) %=-1.0*{e1,e2}
```

The pseudoscalar and its inverse for G3

```
(%i22) ldisplay(I,Ii)$

(%t22) I={e1,e2,e3}
(%t23) Ii=-{e1,e2,e3}
```

Exercise 6.14
page 105

Just calculate I squared, using both functions bladep() and bldpwr()

```
(%i24) I~*I$
       ldisplay(%)$
       I@*2$
       ldisplay(%)$

(%t25) %=-1
(%t27) %=-1
```

Problem 6.4.5a
page 109

Compute a vector orthogonal to bold printed vectors ub(old) and vb(old)
using the inverse pseudoscalar

```
(%i28) ub:{e1}+2*{e2}+3*{e3}$
       vb:2*{e1}+3*{e2}+4*{e3}$
       (ub&^vb)&*Ii$
       ldisplay(%)$

(%t31)/R/ %=-{e3}+2*{e2}-{e1}
```