LAGA_chapter06.03.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

Inner and Outer Products in the geometric algebra, G4

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

Initialization

```
(%i40) 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

Exercise 6.8
page 101

the (left) inner blade product using the functions bladepinn() and bladep()

Exercise 6.8a

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

 (%t13) %={e2}
```

Exercise 6.8b

```
(%i14) ({e1}~*{e2})~.({e1})$
       ldisplay(%)$

 (%t15) %=0
```

Exercise 6.8c

```
(%i16) ({e1}~*{e2})~.({e3}~*{e4}~*{e1}~*{e2})$
       ldisplay(%)$

 (%t17) %=-{e3,e4}
```

Exercise 6.9
page 101

the outer blade product using the functions bladepout() and bladep()

Exercise 6.9a

```
(%i18) ({e1}~*{e2})~^({e3})$
       ldisplay(%)$

 (%t19) %={e1,e2,e3}
```

Exercise 6.9b

```
(%i20) ({e1}~*{e2})~^({e2}~*{e3})$
       ldisplay(%)$

 (%t21) %=0
```

Exercise 6.10
page 102

compute an inner and outer product of multivectors

Exercise 6.10a
using functions bladep() and geompinn()

```
(%i22) (3*{e1}-2*{e2}~*{e3})&.(7+{e2}~*{e3}+2*{e1}~*{e2}~*{e3})$
       ldisplay(%)$

 (%t23)/R/ %=6*{e2,e3}+4*{e1}+2
```

Exercise 6.10b
using functions bladep() and geompout()

```
(%i24) (3*{e1}-2*{e2}~*{e3})&^(7+{e2}~*{e3}+2*{e1}~*{e2}~*{e3})$
       ldisplay(%)$

 (%t25)/R/ %=-14*{e2,e3}+21*{e1}+3*{e1,e2,e3}
```