```
Maxima 5.9.1 http://maxima.sourceforge.net
Using Lisp CMU Common Lisp 19a
Distributed under the GNU Public License. See the file COPYING.
Dedicated to the memory of William Schelter.
This is a development version of Maxima. The function bug_report()
provides bug reporting information.
```

```
(%i1) load("tensor.lisp");
```

(%o1) tensor.lisp

```
(%i2) a : [1,2] ot [sin(x),cos(x),tan(x)] ot [1,x,x^2,x^4];
```

(%o2) $[[[\sin x, x\sin x, x^2\sin x, x^4\sin x], [\cos x, x\cos x, x^2\cos x, x^4\cos x], [\tan x, x\tan x, x^2\tan x, x^4\tan x]], [[2\sin x, 2x\sin x, 2x^2\sin x, 2x^4\sin x], [2\cos x, 2x\cos x, 2x^2\cos x, 2x^4\cos x], [2\tan x, 2x\tan x, 2x^2\tan x, 2x^4\tan x]]]$

```
(%i3) tensortype(a);
```

(%o3) $[2,3,4]$

```
(%i4) tensorrank(a);
```

(%o4) 3

```
(%i5) b : [s,t];
```

(%o5) $[s,t]$

```
(%i6) c : a ot b;
```

(%o6) $[[[[s\sin x, t\sin x], [sx\sin x, tx\sin x], [sx^2\sin x, tx^2\sin x], [sx^4\sin x, tx^4\sin x]], [[s\cos x, t\cos x], [sx\cos x, tx\cos x], [sx^2\cos x, tx^2\cos x], [sx^4\cos x, tx^4\cos x]], [[s\tan x, t\tan x], [sx\tan x, tx\tan x], [sx^2\tan x, tx^2\tan x], [sx^4\tan x, tx^4\tan x]]], [[[2s\sin x, 2t\sin x], [2sx\sin x, 2tx\sin x], [2sx^2\sin x, 2tx^2\sin x], [2sx^4\sin x, 2tx^4\sin x]], [[2s\cos x, 2t\cos x], [2sx\cos x, 2tx\cos x], [2sx^2\cos x, 2tx^2\cos x], [2sx^4\cos x, 2tx^4\cos x]], [[2s\tan x, 2t\tan x], [2sx\tan x, 2tx\tan x], [2sx^2\tan x, 2tx^2\tan x], [2sx^4\tan x, 2tx^4\tan x]]]]$

```
(%i7) tensortype(c);
```

(%o7) $[2,3,4,2]$

```
(%i8) d : b ot a;
```

(%o8) $[[[[s\sin x, sx\sin x, sx^2\sin x, sx^4\sin x], [s\cos x, sx\cos x, sx^2\cos x, sx^4\cos x], [s\tan x, sx\tan x, sx^2\tan x, sx^4\tan x]], [[2s\sin x, 2sx\sin x, 2sx^2\sin x, 2sx^4\sin x], [2s\cos x, 2sx\cos x, 2sx^2\cos x, 2sx^4\cos x], [2s\tan x, 2sx\tan x, 2sx^2\tan x, 2sx^4\tan x]]], [[[t\sin x, tx\sin x, tx^2\sin x, tx^4\sin x], [t\cos x, tx\cos x, tx^2\cos x, tx^4\cos x], [t\tan x, tx\tan x, tx^2\tan x, tx^4\tan x]], [[2t\sin x, 2tx\sin x, 2tx^2\sin x, 2tx^4\sin x], [2t\cos x, 2tx\cos x, 2tx^2\cos x, 2tx^4\cos x], [2t\tan x, 2tx\tan x, 2tx^2\tan x, 2tx^4\tan x]]]]$

```
(%i9) tensortype(d);
```

(%o9) $[2, 2, 3, 4]$

```
(%i10) e : [-1, 2, 0, 3];
```

(%o10) $[-1, 2, 0, 3]$

```
(%i11) tensortype(e);
```

(%o11) $[4]$

```
(%i12) load(eigen);

Warning - you are redefining the MACSYMA function EIGENVALUES
Warning - you are redefining the MACSYMA function EIGENVECTORS
```

(%o12) /usr/local/share/maxima/5.9.1/share/matrix/eigen.mac

```
(%i13) f : d tvc e;
```

(%o13) $[[[(3\,s\,x^4+2\,s\,x-s)\sin x,(3\,s\,x^4+2\,s\,x-s)\cos x,(3\,s\,x^4+2\,s\,x-s)\tan x],[(6\,s\,x^4+4\,s\,x-2\,s)\sin x,(6\,s\,x^4+4\,s\,x-2\,s)\cos x,(6\,s\,x^4+4\,s\,x-2\,s)\tan x]],[[(3\,t\,x^4+2\,t\,x-t)\sin x,(3\,t\,x^4+2\,t\,x-t)\cos x,(3\,t\,x^4+2\,t\,x-t)\tan x],[(6\,t\,x^4+4\,t\,x-2\,t)\sin x,(6\,t\,x^4+4\,t\,x-2\,t)\cos x,(6\,t\,x^4+4\,t\,x-2\,t)\tan x]]]$

```
(%i14) tensortype(f);
```

(%o14) $[2, 2, 3]$

```
(%i15) g : d ot e;
```

(%o15) $[[[[[-s\sin x,2\,s\sin x,0,3\,s\sin x],[-s\,x\sin x,2\,s\,x\sin x,0,3\,s\,x\sin x],[-s\,x^2\sin x,2\,s\,x^2\sin x,0,3\,s\,x^2\sin x],[-s\,x^4\sin x,2\,s\,x^4\sin x,0,3\,s\,x^4\sin x]],[[-s\cos x,2\,s\cos x,0,3\,s\cos x],[-s\,x\cos x,2\,s\,x\cos x,0,3\,s\,x\cos x],[-s\,x^2\cos x,2\,s\,x^2\cos x,0,3\,s\,x^2\cos x],[-s\,x^4\cos x,2\,s\,x^4\cos x,0,3\,s\,x^4\cos x]],[[-s\tan x,2\,s\tan x,0,3\,s\tan x],[-s\,x\tan x,2\,s\,x\tan x,0,3\,s\,x\tan x],[-s\,x^2\tan x,2\,s\,x^2\tan x,0,3\,s\,x^2\tan x],[-s\,x^4\tan x,2\,s\,x^4\tan x,0,3\,s\,x^4\tan x]]],[[[-2\,s\sin x,4\,s\sin x,0,6\,s\sin x],[-2\,s\,x\sin x,4\,s\,x\sin x,0,6\,s\,x\sin x],[-2\,s\,x^2\sin x,4\,s\,x^2\sin x,0,6\,s\,x^2\sin x],[-2\,s\,x^4\sin x,4\,s\,x^4\sin x,0,6\,s\,x^4\sin x]],[[-2\,s\cos x,4\,s\cos x,0,6\,s\cos x],[-2\,s\,x\cos x,4\,s\,x\cos x,0,6\,s\,x\cos x],[-2\,s\,x^2\cos x,4\,s\,x^2\cos x,0,6\,s\,x^2\cos x],[-2\,s\,x^4\cos x,4\,s\,x^4\cos x,0,6\,s\,x^4\cos x]],[[-2\,s\tan x,4\,s\tan x,0,6\,s\tan x],[-2\,s\,x\tan x,4\,s\,x\tan x,0,6\,s\,x\tan x],[-2\,s\,x^2\tan x,4\,s\,x^2\tan x,0,6\,s\,x^2\tan x],[-2\,s\,x^4\tan x,4\,s\,x^4\tan x,0,6\,s\,x^4\tan x]]]],[[[[-t\sin x,2\,t\sin x,0,3\,t\sin x],[-t\,x\sin x,2\,t\,x\sin x,0,3\,t\,x\sin x],[-t\,x^2\sin x,2\,t\,x^2\sin x,0,3\,t\,x^2\sin x],[-t\,x^4\sin x,2\,t\,x^4\sin x,0,3\,t\,x^4\sin x]],[[-t\cos x,2\,t\cos x,0,3\,t\cos x],[-t\,x\cos x,2\,t\,x\cos x,0,3\,t\,x\cos x],[-t\,x^2\cos x,2\,t\,x^2\cos x,0,3\,t\,x^2\cos x],[-t\,x^4\cos x,2\,t\,x^4\cos x,0,3\,t\,x^4\cos x]],[[-t\tan x,2\,t\tan x,0,3\,t\tan x],[-t\,x\tan x,2\,t\,x\tan x,0,3\,t\,x\tan x],[-t\,x^2\tan x,2\,t\,x^2\tan x,0,3\,t\,x^2\tan x],[-t\,x^4\tan x,2\,t\,x^4\tan x,0,3\,t\,x^4\tan x]]],[[[-2\,t\sin x,4\,t\sin x,0,6\,t\sin x],[-2\,t\,x\sin x,4\,t\,x\sin x,0,6\,t\,x\sin x],[-2\,t\,x^2\sin x,4\,t\,x^2\sin x,0,6\,t\,x^2\sin x],[-2\,t\,x^4\sin x,4\,t\,x^4\sin x,0,6\,t\,x^4\sin x]],[[-2\,t\cos x,4\,t\cos x,0,6\,t\cos x],[-2\,t\,x\cos x,4\,t\,x\cos x,0,6\,t\,x\cos x],[-2\,t\,x^2\cos x,4\,t\,x^2\cos x,0,6\,t\,x^2\cos x],[-2\,t\,x^4\cos x,4\,t\,x^4\cos x,0,6\,t\,x^4\cos x]],[[-2\,t\tan x,4\,t\tan x,0,6\,t\tan x],[-2\,t\,x\tan x,4\,t\,x\tan x,0,6\,t\,x\tan x],[-2\,t\,x^2\tan x,4\,t\,x^2\tan x,0,6\,t\,x^2\tan x],[-2\,t\,x^4\tan x,4\,t\,x^4\tan x,0,6\,t\,x^4\tan x]]]]]$

```
(%i16) tensortype(g);
```

(%o16) $[2, 2, 3, 4, 4]$

```
(%i17) ff : cntrlst2(g);
```

(%o17) $\left[\left[\left[3\,s\,x^4\sin x+2\,s\,x\sin x-s\sin x, 3\,s\,x^4\cos x+2\,s\,x\cos x-s\cos x, 3\,s\,x^4\tan x+2\,s\,x\tan x-s\tan x\right], \left[6\,s\,x^4\sin x+4\,s\,x\sin x-2\,s\sin x, 6\,s\,x^4\cos x+4\,s\,x\cos x-2\,s\cos x, 6\,s\,x^4\tan x+4\,s\,x\tan x-2\,s\tan x\right]\right], \left[\left[3\,t\,x^4\sin x+2\,t\,x\sin x-t\sin x, 3\,t\,x^4\cos x+2\,t\,x\cos x-t\cos x, 3\,t\,x^4\tan x+2\,t\,x\tan x-t\tan x\right], \left[6\,t\,x^4\sin x+4\,t\,x\sin x-2\,t\sin x, 6\,t\,x^4\cos x+4\,t\,x\cos x-2\,t\cos x, 6\,t\,x^4\tan x+4\,t\,x\tan x-2\,t\tan x\right]\right]\right]$

```
(%i18) tensortype(ff);
```

(%o18) $[2, 2, 3]$

```
(%i19) ff[2][1][3];
```

(%o19) $3\,t\,x^4\tan x+2\,t\,x\tan x-t\tan x$

```
(%i20) ratsimp(f - ff);
```

(%o20) $[[[0, 0, 0], [0, 0, 0]], [[0, 0, 0], [0, 0, 0]]]$

```
(%i21) fff : cntrct(g, 4, 5);
```

(%o21) $\left[\left[\left[3\,s\,x^4\sin x+2\,s\,x\sin x-s\sin x, 3\,s\,x^4\cos x+2\,s\,x\cos x-s\cos x, 3\,s\,x^4\tan x+2\,s\,x\tan x-s\tan x\right], \left[6\,s\,x^4\sin x+4\,s\,x\sin x-2\,s\sin x, 6\,s\,x^4\cos x+4\,s\,x\cos x-2\,s\cos x, 6\,s\,x^4\tan x+4\,s\,x\tan x-2\,s\tan x\right]\right], \left[\left[3\,t\,x^4\sin x+2\,t\,x\sin x-t\sin x, 3\,t\,x^4\cos x+2\,t\,x\cos x-t\cos x, 3\,t\,x^4\tan x+2\,t\,x\tan x-t\tan x\right], \left[6\,t\,x^4\sin x+4\,t\,x\sin x-2\,t\sin x, 6\,t\,x^4\cos x+4\,t\,x\cos x-2\,t\cos x, 6\,t\,x^4\tan x+4\,t\,x\tan x-2\,t\tan x\right]\right]\right]$

```
(%i22) ratsimp(ff - fff);
```

(%o22) $[[[0, 0, 0], [0, 0, 0]], [[0, 0, 0], [0, 0, 0]]]$

```
(%i23) tensortype(fff);
```

(%o23) $[2, 2, 3]$

```
(%i24) cntrct(fff,1,2);
```

(%o24) $\left[6\,t\,x^4\sin x+3\,s\,x^4\sin x+4\,t\,x\sin x+2\,s\,x\sin x-2\,t\sin x-s\sin x, 6\,t\,x^4\cos x+3\,s\,x^4\cos x+4\,t\,x\cos x+2\,s\,x\cos x-2\,t\cos x-s\cos x, 6\,t\,x^4\tan x+3\,s\,x^4\tan x+4\,t\,x\tan x+2\,s\,x\tan x-2\,t\tan x-s\tan x\right]$

```
(%i25) tensortype(%o24);
```

(%o25) $[3]$

```
(%i26) kill(a,b,c,d,e,f,ff,fff,g);
```

(%o26) DONE

```
(%i27) a : ([1,2] ot [3,4,5]) ot ([6,5,4,3] ot [-1,2,-3,4,-5]);
```

(%o27) $[[[[-18,36,-54,72,-90],[-15,30,-45,60,-75],[-12,24,-36,48,-60],[-9,18,-27,36,-45]],[[-24,48,-72,96,-120],[-20,40,-60,80,-100],[-16,32,-48,64,-80],[-12,24,-36,48,-60]],[[-30,60,-90,120,-150],[-25,50,-75,100,-125],[-20,40,-60,80,-100],[-15,30,-45,60,-75]]],[[[-36,72,-108,144,-180],[-30,60,-90,120,-150],[-24,48,-72,96,-120],[-18,36,-54,72,-90]],[[-48,96,-144,192,-240],[-40,80,-120,160,-200],[-32,64,-96,128,-160],[-24,48,-72,96,-120]],[[-60,120,-180,240,-300],[-50,100,-150,200,-250],[-40,80,-120,160,-200],[-30,60,-90,120,-150]]]]$

```
(%i28) tensortype(a);
```

(%o28) $[2,3,4,5]$

```
(%i29) b : [x,y];
```

(%o29) $[x,y]$

```
(%i30) c : a ot b;
```

(%o30) $[[[[[-18\,x,-18\,y],[36\,x,36\,y],[-54\,x,-54\,y],[72\,x,72\,y],[-90\,x,-90\,y]],[[-15\,x,-15\,y],[30\,x,30\,y],[-45\,x,-45\,y],[60\,x,60\,y],[-75\,x,-75\,y]],[[-12\,x,-12\,y],[24\,x,24\,y],[-36\,x,-36\,y],[48\,x,48\,y],[-60\,x,-60\,y]],[[-9\,x,-9\,y],[18\,x,18\,y],[-27\,x,-27\,y],[36\,x,36\,y],[-45\,x,-45\,y]]],[[[-24\,x,-24\,y],[48\,x,48\,y],[-72\,x,-72\,y],[96\,x,96\,y],[-120\,x,-120\,y]],[[-20\,x,-20\,y],[40\,x,40\,y],[-60\,x,-60\,y],[80\,x,80\,y],[-100\,x,-100\,y]],[[-16\,x,-16\,y],[32\,x,32\,y],[-48\,x,-48\,y],[64\,x,64\,y],[-80\,x,-80\,y]],[[-12\,x,-12\,y],[24\,x,24\,y],[-36\,x,-36\,y],[48\,x,48\,y],[-60\,x,-60\,y]]],[[[-30\,x,-30\,y],[60\,x,60\,y],[-90\,x,-90\,y],[120\,x,120\,y],[-150\,x,-150\,y]],[[-25\,x,-25\,y],[50\,x,50\,y],[-75\,x,-75\,y],[100\,x,100\,y],[-125\,x,-125\,y]],[[-20\,x,-20\,y],[40\,x,40\,y],[-60\,x,-60\,y],[80\,x,80\,y],[-100\,x,-100\,y]],[[-15\,x,-15\,y],[30\,x,30\,y],[-45\,x,-45\,y],[60\,x,60\,y],[-75\,x,-75\,y]]]],[[[[-36\,x,-36\,y],[72\,x,72\,y],[-108\,x,-108\,y],[144\,x,144\,y],[-180\,x,-180\,y]],[[-30\,x,-30\,y],[60\,x,60\,y],[-90\,x,-90\,y],[120\,x,120\,y],[-150\,x,-150\,y]],[[-24\,x,-24\,y],[48\,x,48\,y],[-72\,x,-72\,y],[96\,x,96\,y],[-120\,x,-120\,y]],[[-18\,x,-18\,y],[36\,x,36\,y],[-54\,x,-54\,y],[72\,x,72\,y],[-90\,x,-90\,y]]],[[[-48\,x,-48\,y],[96\,x,96\,y],[-144\,x,-144\,y],[192\,x,192\,y],[-240\,x,-240\,y]],[[-40\,x,-40\,y],[80\,x,80\,y],[-120\,x,-120\,y],[160\,x,160\,y],[-200\,x,-200\,y]],[[-32\,x,-32\,y],[64\,x,64\,y],[-96\,x,-96\,y],[128\,x,128\,y],[-160\,x,-160\,y]],[[-24\,x,-24\,y],[48\,x,48\,y],[-72\,x,-72\,y],[96\,x,96\,y],[-120\,x,-120\,y]]],[[[-60\,x,-60\,y],[120\,x,120\,y],[-180\,x,-180\,y],[240\,x,240\,y],[-300\,x,-300\,y]],[[-50\,x,-50\,y],[100\,x,100\,y],[-150\,x,-150\,y],[200\,x,200\,y],[-250\,x,-250\,y]],[[-40\,x,-40\,y],[80\,x,80\,y],[-120\,x,-120\,y],[160\,x,160\,y],[-200\,x,-200\,y]],[[-30\,x,-30\,y],[60\,x,60\,y],[-90\,x,-90\,y],[120\,x,120\,y],[-150\,x,-150\,y]]]]]$

```
(%i31) tensortype(c);
```

(%o31) $[2,3,4,5,2]$

```
(%i32) d : exchnext(c, 4)$
(%i33) tensortype(d);
```

(%o33) $[2,3,4,2,5]$

```
(%i34) f : exchnext(d, 3)$
(%i35) tensortype(f);
```

(%o35) $[2,3,2,4,5]$

```
(%i36) g : exchnext(f, 2)$
(%i37) tensortype(g);
```

(%o37) $[2,2,3,4,5]$

```
(%i38) h : exchnext(g, 1);
```

(%o38) $[[[[[-18\,x,36\,x,-54\,x,72\,x,-90\,x],[-15\,x,30\,x,-45\,x,60\,x,-75\,x],[-12\,x,24\,x,-36\,x,48\,x,-60\,x],[-9\,x,18\,x,-27\,x,36\,x,-45\,x]],[[-24\,x,48\,x,-72\,x,96\,x,-120\,x],[-20\,x,40\,x,-60\,x,80\,x,-100\,x],[-16\,x,32\,x,-48\,x,64\,x,-80\,x],[-12\,x,24\,x,-36\,x,48\,x,-60\,x]],[[-30\,x,60\,x,-90\,x,120\,x,-150\,x],[-25\,x,50\,x,-75\,x,100\,x,-125\,x],[-20\,x,40\,x,-60\,x,80\,x,-100\,x],[-15\,x,30\,x,-45\,x,60\,x,-75\,x]]],[[[-36\,x,72\,x,-108\,x,144\,x,-180\,x],[-30\,x,60\,x,-90\,x,120\,x,-150\,x],[-24\,x,48\,x,-72\,x,96\,x,-120\,x],[-18\,x,36\,x,-54\,x,72\,x,-90\,x]],[[-48\,x,96\,x,-144\,x,192\,x,-240\,x],[-40\,x,80\,x,-120\,x,160\,x,-200\,x],[-32\,x,64\,x,-96\,x,128\,x,-160\,x],[-24\,x,48\,x,-72\,x,96\,x,-120\,x]],[[-60\,x,120\,x,-180\,x,240\,x,-300\,x],[-50\,x,100\,x,-150\,x,200\,x,-250\,x],[-40\,x,80\,x,-120\,x,160\,x,-200\,x],[-30\,x,60\,x,-90\,x,120\,x,-150\,x]]]],[[[[-18\,y,36\,y,-54\,y,72\,y,-90\,y],[-15\,y,30\,y,-45\,y,60\,y,-75\,y],[-12\,y,24\,y,-36\,y,48\,y,-60\,y],[-9\,y,18\,y,-27\,y,36\,y,-45\,y]],[[-24\,y,48\,y,-72\,y,96\,y,-120\,y],[-20\,y,40\,y,-60\,y,80\,y,-100\,y],[-16\,y,32\,y,-48\,y,64\,y,-80\,y],[-12\,y,24\,y,-36\,y,48\,y,-60\,y]],[[-30\,y,60\,y,-90\,y,120\,y,-150\,y],[-25\,y,50\,y,-75\,y,100\,y,-125\,y],[-20\,y,40\,y,-60\,y,80\,y,-100\,y],[-15\,y,30\,y,-45\,y,60\,y,-75\,y]]],[[[-36\,y,72\,y,-108\,y,144\,y,-180\,y],[-30\,y,60\,y,-90\,y,120\,y,-150\,y],[-24\,y,48\,y,-72\,y,96\,y,-120\,y],[-18\,y,36\,y,-54\,y,72\,y,-90\,y]],[[-48\,y,96\,y,-144\,y,192\,y,-240\,y],[-40\,y,80\,y,-120\,y,160\,y,-200\,y],[-32\,y,64\,y,-96\,y,128\,y,-160\,y],[-24\,y,48\,y,-72\,y,96\,y,-120\,y]],[[-60\,y,120\,y,-180\,y,240\,y,-300\,y],[-50\,y,100\,y,-150\,y,200\,y,-250\,y],[-40\,y,80\,y,-120\,y,160\,y,-200\,y],[-30\,y,60\,y,-90\,y,120\,y,-150\,y]]]]]$

```
(%i39) tensortype(h);
```

(%o39) $[2,2,3,4,5]$

```
(%i40) i : b ot a$
(%i41) tensortype(i);
```

(%o41) $[2,2,3,4,5]$

```
(%i42) ratsimp(i - h);
```

(%o42) $[[[[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]]],[[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]]]],[[[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]]],[[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]],[[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0],[0,0,0,0,0]]]]]$

```
(%i43) tensortype(c);
```

(%o43) $[2,3,4,5,2]$

```
(%i44) exchttype(c,2,4);
```

(%o44) $[[[[[-18\,x,-18\,y],[-24\,x,-24\,y],[-30\,x,-30\,y]],[[-15\,x,-15\,y],[-20\,x,-20\,y],[-25\,x,-25\,y]],[[-12\,x,-12\,y],[-16\,x,-16\,y],[-20\,x,-20\,y]],[[-9\,x,-9\,y],[-12\,x,-12\,y],[-15\,x,-15\,y]]],[[[36\,x,36\,y],[48\,x,48\,y],[60\,x,60\,y]],[[30\,x,30\,y],[40\,x,40\,y],[50\,x,50\,y]],[[24\,x,24\,y],[32\,x,32\,y],[40\,x,40\,y]],[[18\,x,18\,y],[24\,x,24\,y],[30\,x,30\,y]]],[[[-54\,x,-54\,y],[-72\,x,-72\,y],[-90\,x,-90\,y]],[[-45\,x,-45\,y],[-60\,x,-60\,y],[-75\,x,-75\,y]],[[-36\,x,-36\,y],[-48\,x,-48\,y],[-60\,x,-60\,y]],[[-27\,x,-27\,y],[-36\,x,-36\,y],[-45\,x,-45\,y]]],[[[72\,x,72\,y],[96\,x,96\,y],[120\,x,120\,y]],[[60\,x,60\,y],[80\,x,80\,y],[100\,x,100\,y]],[[48\,x,48\,y],[64\,x,64\,y],[80\,x,80\,y]],[[36\,x,36\,y],[48\,x,48\,y],[60\,x,60\,y]]],[[[-90\,x,-90\,y],[-120\,x,-120\,y],[-150\,x,-150\,y]],[[-75\,x,-75\,y],[-100\,x,-100\,y],[-125\,x,-125\,y]],[[-60\,x,-60\,y],[-80\,x,-80\,y],[-100\,x,-100\,y]],[[-45\,x,-45\,y],[-60\,x,-60\,y],[-75\,x,-75\,y]]]],[[[[-36\,x,-36\,y],[-48\,x,-48\,y],[-60\,x,-60\,y]],[[-30\,x,-30\,y],[-40\,x,-40\,y],[-50\,x,-50\,y]],[[-24\,x,-24\,y],[-32\,x,-32\,y],[-40\,x,-40\,y]],[[-18\,x,-18\,y],[-24\,x,-24\,y],[-30\,x,-30\,y]]],[[[72\,x,72\,y],[96\,x,96\,y],[120\,x,120\,y]],[[60\,x,60\,y],[80\,x,80\,y],[100\,x,100\,y]],[[48\,x,48\,y],[64\,x,64\,y],[80\,x,80\,y]],[[36\,x,36\,y],[48\,x,48\,y],[60\,x,60\,y]]],[[[-108\,x,-108\,y],[-144\,x,-144\,y],[-180\,x,-180\,y]],[[-90\,x,-90\,y],[-120\,x,-120\,y],[-150\,x,-150\,y]],[[-72\,x,-72\,y],[-96\,x,-96\,y],[-120\,x,-120\,y]],[[-54\,x,-54\,y],[-72\,x,-72\,y],[-90\,x,-90\,y]]],[[[144\,x,144\,y],[192\,x,192\,y],[240\,x,240\,y]],[[120\,x,120\,y],[160\,x,160\,y],[200\,x,200\,y]],[[96\,x,96\,y],[128\,x,128\,y],[160\,x,160\,y]],[[72\,x,72\,y],[96\,x,96\,y],[120\,x,120\,y]]],[[[-180\,x,-180\,y],[-240\,x,-240\,y],[-300\,x,-300\,y]],[[-150\,x,-150\,y],[-200\,x,-200\,y],[-250\,x,-250\,y]],[[-120\,x,-120\,y],[-160\,x,-160\,y],[-200\,x,-200\,y]],[[-90\,x,-90\,y],[-120\,x,-120\,y],[-150\,x,-150\,y]]]]$

```
(%i45) tensortype(%o44);
```

(%o45) $[2,5,4,3,2]$

```
(%i46) zerotensor([4,3,2]);
```

(%o46) $[[[0,0],[0,0],[0,0]],[[0,0],[0,0],[0,0]],[[0,0],[0,0],[0,0]],[[0,0],[0,0],[0,0]]]$

```
(%i47) kill(ALL);
```

(%o0) DONE

(%i1)