

Maxima 5.9.1 <http://maxima.sourceforge.net>
Using Lisp CMU Common Lisp 19a
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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-tmp.mac");
```

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

```
(%o1) tensor-tmp.mac
```

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

Incorrect syntax: Premature termination of input at ;.

```
;
```

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

```
(%o3) [[[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, 2 x sin x, 2 x^2 sin x, 2 x^4 sin x], [2 cos x, 2 x cos x, 2 x^2 cos x, 2 x^4 cos x], [2 tan x, 2 x tan x, 2 x^2 tan x, 2 x^4 tan x]]]
```

```
(%i4) tensortype(a);
```

```
(%o4) [2,3,4]
```

```
(%i5) tensorrank(a);
```

```
(%o5) 3
```

```
(%i6) b : [s,t];
```

```
(%o6) [s, t]
```

```
(%i7) c : a @x@ b;
```

```
(%o7) [[[[[s sin x, t sin x], [s x sin x, t x sin x], [s x^2 sin x, t x^2 sin x], [s x^4 sin x, t x^4 sin x]], [s cos x, t cos x], [s x cos x, t x cos x], [s x^2 cos x, t x^2 cos x], [s x^4 cos x, t x^4 cos x]], [[s tan x, t tan x], [s x tan x, t x tan x], [s x^2 tan x, t x^2 tan x], [s x^4 tan x, t x^4 tan x]]], [[2 s sin x, 2 t sin x], [2 s x sin x, 2 t x sin x], [2 s x^2 sin x, 2 t x^2 sin x], [2 s x^4 sin x, 2 t x^4 sin x]], [[2 s cos x, 2 t cos x], [2 s x cos x, 2 t x cos x], [2 s x^2 cos x, 2 t x^2 cos x], [2 s x^4 cos x, 2 t x^4 cos x]], [[2 s tan x, 2 t tan x], [2 s x tan x, 2 t x tan x], [2 s x^2 tan x, 2 t x^2 tan x], [2 s x^4 tan x, 2 t x^4 tan x]]]]]
```

```
(%i8) tensortype(c);
```

```
(%o8) [2,3,4,2]
```

```
(%i9) d : b @x@ a;
```

```
(%o9) [[[[[s sin x, s x sin x, s x^2 sin x, s x^4 sin x], [s cos x, s x cos x, s x^2 cos x, s x^4 cos x], [s tan x,
s x tan x, s x^2 tan x, s x^4 tan x]], [[2 s sin x, 2 s x sin x, 2 s x^2 sin x, 2 s x^4 sin x], [2 s cos x, 2 s x cos x,
2 s x^2 cos x, 2 s x^4 cos x], [2 s tan x, 2 s x tan x, 2 s x^2 tan x, 2 s x^4 tan x]]], [[t sin x, t x sin x,
t x^2 sin x, t x^4 sin x], [t cos x, t x cos x, t x^2 cos x, t x^4 cos x], [t tan x, t x tan x, t x^2 tan x, t x^4 tan x]],
[[2 t sin x, 2 t x sin x, 2 t x^2 sin x, 2 t x^4 sin x], [2 t cos x, 2 t x cos x, 2 t x^2 cos x, 2 t x^4 cos x], [2 t tan x,
2 t x tan x, 2 t x^2 tan x, 2 t x^4 tan x]]]]]
```

```
(%i10) tensorstype(d);
```

```
(%o10) [2, 2, 3, 4]
```

```
(%i11) e : [-1, 2, 0 , 3]
```

```
(%o11) [-1, 2, 0, 3]
```

```
(%i12) tensorstype(e);
```

```
(%o12) [4]
```

```
(%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) tensorstype(f);
```

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

```
(%i15) g : d @x@ 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) [[[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], [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]], [[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], [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]]]

(%i18) tensortype(ff);

(%o18) [2, 2, 3]

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

(%o19) 3 t x^4 cos x + 2 t x cos x - t cos 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) [[[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], [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]], [[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], [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]]]

(%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) [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]

(%i25) tensortype(%o24);

(%o25) [3]

(%i26) kill(ALL);

(%o0) DONE

(%i1) load("tensor-tmp.mac");

```

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

(%o1) tensor-tmp.mac

(%i2) a : ([1,2] @x@ [3,4,5]) @x@ ([6,5,4,3] @x@ [-1,2,-3,4,-5]);

(%o2) [[[[[-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]]]]]

(%i3) tensortype(a);

(%o3) [2, 3, 4, 5]

(%i4) b : [x,y];

(%o4) [x, y]

(%i5) c : a @x@ b;

(%o5) [[[[[-18x, -18y], [36x, 36y], [-54x, -54y], [72x, 72y], [-90x, -90y]], [[-15x, -15y], [30x, 30y], [-45x, -45y], [60x, 60y], [-75x, -75y]], [[-12x, -12y], [24x, 24y], [-36x, -36y], [48x, 48y], [-60x, -60y]], [[-9x, -9y], [18x, 18y], [-27x, -27y], [36x, 36y], [-45x, -45y]], [[[-24x, -24y], [48x, 48y], [-72x, -72y], [96x, 96y], [-120x, -120y]], [[-20x, -20y], [40x, 40y], [-60x, -60y], [80x, 80y], [-100x, -100y]], [[-16x, -16y], [32x, 32y], [-48x, -48y], [64x, 64y], [-80x, -80y]], [[-12x, -12y], [24x, 24y], [-36x, -36y], [48x, 48y], [-60x, -60y]], [[[-30x, -30y], [60x, 60y], [-90x, -90y], [120x, 120y], [-150x, -150y]], [[-25x, -25y], [50x, 50y], [-75x, -75y], [100x, 100y], [-125x, -125y]], [[-20x, -20y], [40x, 40y], [-60x, -60y], [80x, 80y], [-100x, -100y]], [[-15x, -15y], [30x, 30y], [-45x, -45y], [60x, 60y], [-75x, -75y]], [[[-36x, -36y], [72x, 72y], [-108x, -108y], [144x, 144y], [-180x, -180y]], [[-30x, -30y], [60x, 60y], [-90x, -90y], [120x, 120y], [-150x, -150y]], [[-24x, -24y], [48x, 48y], [-72x, -72y], [96x, 96y], [-120x, -120y]], [[-18x, -18y], [36x, 36y], [-54x, -54y], [72x, 72y], [-90x, -90y]], [[[-48x, -48y], [96x, 96y], [-144x, -144y], [192x, 192y], [-240x, -240y]], [[-40x, -40y], [80x, 80y], [-120x, -120y], [160x, 160y], [-200x, -200y]], [[-32x, -32y], [64x, 64y], [-96x, -96y], [128x, 128y], [-160x, -160y]], [[-24x, -24y], [48x, 48y], [-72x, -72y], [96x, 96y], [-120x, -120y]], [[[-60x, -60y], [120x, 120y], [-180x, -180y], [240x, 240y], [-300x, -300y]], [[-50x, -50y], [100x, 100y], [-150x, -150y], [200x, 200y], [-250x, -250y]], [[-40x, -40y], [80x, 80y], [-120x, -120y], [160x, 160y], [-200x, -200y]], [[-30x, -30y], [60x, 60y], [-90x, -90y], [120x, 120y], [-150x, -150y]]]]]]]

(%i6) tensortype(c);

(%o6) [2, 3, 4, 5, 2]

(%i7) d : exchnext(c, 4)\$

(%i8) tensortype(d);

(%o8) [2, 3, 4, 2, 5]

(%i9) f : exchnext(d, 3)\$

(%i10) tensortype(f);

```
(%o10) [2, 3, 2, 4, 5]

(%i11) g : exchnext(f, 2)$
(%i12) tensortype(g);

(%o12) [2, 2, 3, 4, 5]

(%i13) h : exchnext(g, 1);

(%o13) [[[[[-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]]]]]]

(%i14) tensortype(h);

(%o14) [2, 2, 3, 4, 5]

(%i15) i : b @x@ a$
(%i16) tensortype(i);

(%o16) [2, 2, 3, 4, 5]

(%i17) ratsimp(i - h);

(%o17) [[[[[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]]]]]]

(%i18) tensortype(c);

(%o18) [2, 3, 4, 5, 2]

(%i19) exchttype(c, 2, 4);
```

```
(%o19) [[[[[-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]]]]]]
```

```
(%i20) tensor(%o19);
```

```
(%o20) [2, 5, 4, 3, 2]
```

```
(%i21) zerotensor([4, 3, 2]);
```

```
(%o21) [[[0, 0], [0, 0], [0, 0]], [[0, 0], [0, 0], [0, 0]], [[0, 0], [0, 0], [0, 0]], [[0, 0], [0, 0], [0, 0]]]
```

```
(%i22)
```