1 restart;maple_mode(1);cas_setup(0,0,0,1,0,1e-10,10,[1,50,0,25],0,0,0);#radians,pas de cmplx, pas de Sqrt

([], Warning: some commands like subs might change arguments order , 0, 0, 0, 1, 0, 1e-10 , 10, [1 5

2

3 Prog Edit Add nxt OK Save

```
monpolyfaddeev:= proc(A)
local a,n,B,P;
n:=dim(A)[1];a:=1:B:=identity(n);P:=[a];
for i from n-1 to 0 by -1 do
B:=normal(B*A);
a:=trace(B)/(i-n);
P:=[op(P),a];B:=B+a*identity(n)  od;
P;
end proc:
```

// Warning: i declared as global variable(s)
// End defining monpolyfaddeev

Done

4 n:=30;A:=matrix(n,n,(i,j)->rand(21)-10):

// Success

(30, Done)

5 normal(poly2symb(monpolyfaddeev(A),x));

Evaluation time: 0.94

$x^{30}+(-7)\cdot x^{29}+(-387)\cdot x^{28}+(-8113)\cdot x^{27}+360369\cdot x^{26}+(-1130723)\cdot x^{25}+(-8725679)\cdot x^{24}+4428175555\cdot x$
$1004212188740741\cdot x^{19}+327964137762253O8\cdot x^{18}+(-7525306724112494109)\cdot x^{17}+394304810801803208$
$(-131139153708144756757925 5)\cdot x^{13}+754509816874890276553921 25\cdot x^{12}+(-125523283147439215831316$
$(-146815700499140223810594848674)\cdot x^{9}+685914657592626528860492998 7028\cdot x^{8}+243628204803758O5$
$(-293174637140022188970422385985 57291)\cdot x^{5}+98940399910150954578874492401589791O\cdot x^{4}+(-16662$
$(-295179565599305729842609915778376 63929)\cdot x^{2}+649251732900074175864953663626279262822\cdot x+8$

6 charpoly(A)-monpolyfaddeev(A);

Evaluation time: 1.11

0

7 time(monpolyfaddeev(A));

Evaluation time: 0.96

0.96

8 time(charpoly(A));

0.16

9 coeff(3*x^4+2*x^3+y^3,x,3);

2

10 A:=matrix(3,4,2);matrix(op(dim(A)));

$$\left(\begin{bmatrix}2&2&2&2\\2&2&2&2\\2&2&2&2\end{bmatrix},\begin{bmatrix}0&0&0&0\\0&0&0&0\\0&0&0&0\end{bmatrix}\right)$$

11

12 Prog Edit Add | nxt | OK | Save

```
cf:=proc(P,k)
local i,j;
matrix(op(dim(P)),(i,j)->coeff(P[i,j],x,k));
end_proc ;
```

// Warning: x declared as global variable(s)
// End defining cf

```
proc(P,k)
  local i,j;
  matrix(op(dim(P)), (i,j)->coeff(P[i,j],x,k));

end;
```

13 P:=matrix(3,3,(i,j)->add(rand(7)*x^l,l=0..4));

// Warning: x l declared as global variable(s)

$$\begin{bmatrix} 5+3\cdot x+x^3+5\cdot x^4 & 2+6\cdot x+6\cdot x^2+2\cdot x^3+2\cdot x^4 & 5+6\cdot x+5\cdot x^2+x^3+x^4 \\ 3+2\cdot x^2+3\cdot x^3+6\cdot x^4 & 3+4\cdot x+x^2+x^3+3\cdot x^4 & 6+5\cdot x+2\cdot x^2+x^3+3\cdot x^4 \\ 6+5\cdot x+2\cdot x^2+4\cdot x^3+4\cdot x^4 & 6\cdot x+5\cdot x^2+x^3+2\cdot x^4 & 6+5\cdot x^2+3\cdot x^3+2\cdot x^4 \end{bmatrix}$$

14 A:=matrix(3,3,(i,j)->a[i,j]);

// Warning: a declared as global variable(s)

$$\begin{bmatrix} a[\![1,\ 1]\!] & a[\![1,\ 2]\!] & a[\![1,\ 3]\!] \\ a[\![2,\ 1]\!] & a[\![2,\ 2]\!] & a[\![2,\ 3]\!] \\ a[\![3,\ 1]\!] & a[\![3,\ 2]\!] & a[\![3,\ 3]\!] \end{bmatrix}$$

15 cf(P,4);

$$\begin{bmatrix} 5 & 2 & 1 \\ 6 & 3 & 3 \\ 4 & 2 & 2 \end{bmatrix}$$

16 R:=P;k:=4;Q:=0;

$$\left(\begin{bmatrix} 5+3\cdot x+x^3+5\cdot x^4 & 2+6\cdot x+6\cdot x^2+2\cdot x^3+2\cdot x^4 & 5+6\cdot x+5\cdot x^2+x^3+x^4 \\ 3+2\cdot x^2+3\cdot x^3+6\cdot x^4 & 3+4\cdot x+x^2+x^3+3\cdot x^4 & 6+5\cdot x+2\cdot x^2+x^3+3\cdot x^4 \\ 6+5\cdot x+2\cdot x^2+4\cdot x^3+4\cdot x^4 & 6\cdot x+5\cdot x^2+x^3+2\cdot x^4 & 6+5\cdot x^2+3\cdot x^3+2\cdot x^4 \end{bmatrix},\ 4,\ 0\right)$$

17 R:=normal(R-cf(R,k)*x^(k-1)*(x*identity(3)-A));Q:=cf(R,k)*x^(k-1)+Q:k:=k-1;

$$\left(\begin{bmatrix} \begin{matrix}5\cdot x^3\cdot(a[\![1,\ 1]\!])+\\ 2\cdot x^3\cdot(a[\![2,\ 1]\!])+\\ x^3\cdot(a[\![3,\ 1]\!])+x^3+3\cdot x+5\end{matrix} & \begin{matrix}5\cdot x^3\cdot(a[\![1,\ 2]\!])+\\ 2\cdot x^3\cdot(a[\![2,\ 2]\!])+\\ x^3\cdot(a[\![3,\ 2]\!])+2\cdot x^3+6\cdot x^2+6\cdot x+2\end{matrix} & \begin{matrix}5\cdot x^3\cdot(a[\![1,\ 3]\!])+\\ 2\cdot x^3\cdot(a[\![2,\ 3]\!])+\\ x^3\cdot(a[\![3,\ 3]\!])+x^3+5\end{matrix} \\ \begin{matrix}6\cdot x^3\cdot(a[\![1,\ 1]\!])+\\ 3\cdot x^3\cdot(a[\![2,\ 1]\!])+\\ 3\cdot x^3\cdot(a[\![3,\ 1]\!])+3\cdot x^3+2\cdot x^2+3\end{matrix} & \begin{matrix}6\cdot x^3\cdot(a[\![1,\ 2]\!])+\\ 3\cdot x^3\cdot(a[\![2,\ 2]\!])+\\ 3\cdot x^3\cdot(a[\![3,\ 2]\!])+x^3+x^2+4\cdot x+3\end{matrix} & \begin{matrix}6\cdot x^3\cdot(a[\![1,\ 3]\!])+\\ 3\cdot x^3\cdot(a[\![2,\ 3]\!])+\\ 3\cdot x^3\cdot(a[\![3,\ 3]\!])+x^3\end{matrix} \\ \begin{matrix}4\cdot x^3\cdot(a[\![1,\ 1]\!])+\\ 2\cdot x^3\cdot(a[\![2,\ 1]\!])+\\ 2\cdot x^3\cdot(a[\![3,\ 1]\!])+4\cdot x^3+2\cdot x^2+5\cdot x+6\end{matrix} & \begin{matrix}4\cdot x^3\cdot(a[\![1,\ 2]\!])+\\ 2\cdot x^3\cdot(a[\![2,\ 2]\!])+\\ 2\cdot x^3\cdot(a[\![3,\ 2]\!])+x^3+5\cdot x^2+6\cdot x\end{matrix} & \begin{matrix}4\cdot x^3\cdot(a[\![1,\ 3]\!])+\\ 2\cdot x^3\cdot(a[\![2,\ 3]\!])+\\ 2\cdot x^3\cdot(a[\![3,\ 3]\!])+3\cdot\end{matrix} \end{bmatrix}\right.$$

18 R:=normal(R-cf(R,k)*x^(k-1)*(x*identity(3)-A));Q:=cf(R,k)*x^(k-1)+Q:k:=k-1;

$5 \cdot x^2 \cdot (a\llbracket 1, 1 \rrbracket)^2+$
$2 \cdot x^2 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$x^2 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$x^2 \cdot (a\llbracket 1, 1 \rrbracket)+$
$5 \cdot x^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$5 \cdot x^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)+$
$x^2 \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 1 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$x^2 \cdot (a\llbracket 3, 1 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$x^2 \cdot (a\llbracket 3, 1 \rrbracket)+3 \cdot x+5$

$5 \cdot x^2 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$5 \cdot x^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)+$
$x^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$x^2 \cdot (a\llbracket 1, 2 \rrbracket)+$
$5 \cdot x^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 2 \rrbracket)^2+$
$x^2 \cdot (a\llbracket 2, 2 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 2 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$x^2 \cdot (a\llbracket 3, 2 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$x^2 \cdot (a\llbracket 3, 2 \rrbracket)+6 \cdot x^2+6 \cdot x+2$

$5 \cdot x^2 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 3 \rrbracket)+$
$5 \cdot x^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 3 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$x^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$5 \cdot x^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$x^2 \cdot (a\llbracket 1, 3 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 2 \rrbracket) \cdot (a\llbracket 2, 3 \rrbracket)+$
$x^2 \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$2 \cdot x^2 \cdot (a\llbracket 2, 3 \rrbracket)+$
$x^2 \cdot (a\llbracket 3, 3 \rrbracket)^2+x^2 \cdot (a\llbracket 3, 3$

Menu

19 R:=normal(R-cf(R,k)*x^(k-1)*(x*identity(3)-A));Q:=cf(R,k)*x^(k-1)+Q:k:=k-1;

$2 \cdot x \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)+$
$x \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$2 \cdot x \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$2 \cdot x \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$x \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$x \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$2 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)^2+$
$5 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)+$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$5 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$2 \cdot x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$5 \cdot x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)^2+$
$5 \cdot x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$

$5 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3,$
$4 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 2,$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 2$
$2 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$5 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)^2+$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket) \cdot (a\llbracket 3, 1$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)+$
$2 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3,$
$5 \cdot x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3,$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket) \cdot (a\llbracket 3, 3$
$x \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$2 \cdot x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3,$
$5 \cdot x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket) \cdot (a\llbracket 3,$
$x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket) \cdot (a\llbracket 3, 2$
$5 \cdot x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket) \cdot (a\llbracket 3,$
$x \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$

Menu

20 R:=normal(R-cf(R,k)*x^(k-1)*(x*identity(3)-A));Q:=cf(R,k)*x^(k-1)+Q:k:=k-1;

$5 \cdot (a\llbracket 1, 1 \rrbracket)^4+$
$2 \cdot (a\llbracket 1, 1 \rrbracket)^3 \cdot (a\llbracket 2, 1 \rrbracket)+$
$(a\llbracket 1, 1 \rrbracket)^3 \cdot (a\llbracket 3, 1 \rrbracket)+$
$(a\llbracket 1, 1 \rrbracket)^3+15 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)+$
$15 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$2 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)+$
$(a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket)+$
$2 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 2, 1 \rrbracket)+$
$2 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 2, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$(a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 3, 1 \rrbracket) \cdot (a\llbracket 3, 3 \rrbracket)+$
$(a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 3, 1 \rrbracket)+$
$4 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket)^2+$
$10 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot$

$5 \cdot (a\llbracket 1, 1 \rrbracket)^3 \cdot (a\llbracket 1, 2 \rrbracket)+$
$2 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket$
$5 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket$
$(a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket)+$
$(a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 2 \rrbracket)+$
$5 \cdot (a\llbracket 1, 1 \rrbracket)^2 \cdot (a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket$
$10 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket)^2 \cdot (a\llbracket 2, 1$
$10 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot$
$(a\llbracket 1, 3 \rrbracket) \cdot (a\llbracket 3, 1 \rrbracket) +$
$4 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot$
$(a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket) +$
$(a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot$
$(a\llbracket 2, 1 \rrbracket) \cdot (a\llbracket 3, 2 \rrbracket) +$
$2 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 1 \rrbracket) \cdot$
$5 \cdot (a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot (a\llbracket 2, 2 \rrbracket)^2$
$(a\llbracket 1, 1 \rrbracket) \cdot (a\llbracket 1, 2 \rrbracket) \cdot$

21 `R2:=add(cf(P,i)*A^i,i=0..4);`

```
5 + 3·(a[[1, 1]]) + 6·(a[[3, 1]]) + 6·(a[[2, 1]]) +
5·((a[[3, 1]])·(a[[1, 1]]) + (a[[3, 3]])·(a[[3, 1]]) + (a[[2, 1]])·(a[[3, 2]])) +
6·((a[[2, 1]])·(a[[1, 1]]) + (a[[2, 3]])·(a[[3, 1]]) + (a[[2, 2]])·(a[[2, 1]])) +
    (a[[1, 1]])·((a[[2, 1]])·(a[[1, 1]]) + (a[[2, 3]])·(a[[3, 1]]) + (a[[2, 2]])·(a[[2, 1]])) +
    (a[[3, 1]])·((a[[2, 1]])·(a[[1, 3]]) + (a[[2, 3]])·(a[[3, 3]]) + (a[[2, 2]])·(a[[2, 3]])) +
2·((a[[2, 1]])·((a[[2, 1]])·(a[[1, 2]]) + (a[[2, 3]])·(a[[3, 2]]) + (a[[2, 2]])^2)                )+
(a[[3, 1]])·((a[[1, 3]])·(a[[1, 1]]) + (a[[3, 3]])·(a[[1, 3]]) + (a[[2, 3]])·(a[[1, 2]])) +
(a[[2, 1]])·((a[[1, 2]])·(a[[1, 1]]) + (a[[3, 2]])·(a[[1, 3]]) + (a[[2, 2]])·(a[[1, 2]])) +
(a[[1, 1]])·((a[[3, 1]])·(a[[1, 1]]) + (a[[3, 3]])·(a[[3, 1]]) + (a[[2, 1]])·(a[[3, 2]])) +
(a[[1, 1]])·((a[[3, 1]])·(a[[1, 3]]) + (a[[2, 1]])·(a[[1, 2]]) + (a[[1, 1]])^2) +
(a[[3, 1]])·((a[[3, 1]])·(a[[1, 3]]) + (a[[2, 3]])·(a[[3, 2]]) + (a[[3, 3]])^2) +
(a[[2, 1]])·((a[[3, 1]])·(a[[1, 2]]) + (a[[3, 2]])·(a[[3, 3]]) + (a[[2, 2]])·(a[[3, 2]])) +
    ((a[[3, 1]])·(a[[1, 1]]) + (a[[3, 3]])·(a[[3, 1]]) + (a[[2, 1]])·(a[[3, 2]]))·
    ((a[[1, 3]])·(a[[1, 1]]) + (a[[3, 3]])·(a[[1, 3]]) + (a[[2, 3]])·(a[[1, 2]]))   +
    ((a[[2, 1]])·(a[[1, 1]]) + (a[[2, 3]])·(a[[3, 1]]) + (a[[2, 2]])·(a[[2, 1]]))·
```

22 `normal(R2-R);`

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

23