1
```
purge(t,x,y);
```
(No such variable t, No such variable x, No such variable y)

2
```
xt:=(1+t^2-t)/(1+t+t^2);
```
$$\frac{t^2-t+1}{t^2+t+1}$$

3
```
yt:=(1+t^2-t^4)/(1+t+t^4);
```
$$\frac{-t^4+t^2+1}{t^4+t+1}$$

4
```
P1:=denom(xt)*x-numer(xt);
```
$$x*(t^2+t+1)-t^2+t-1$$

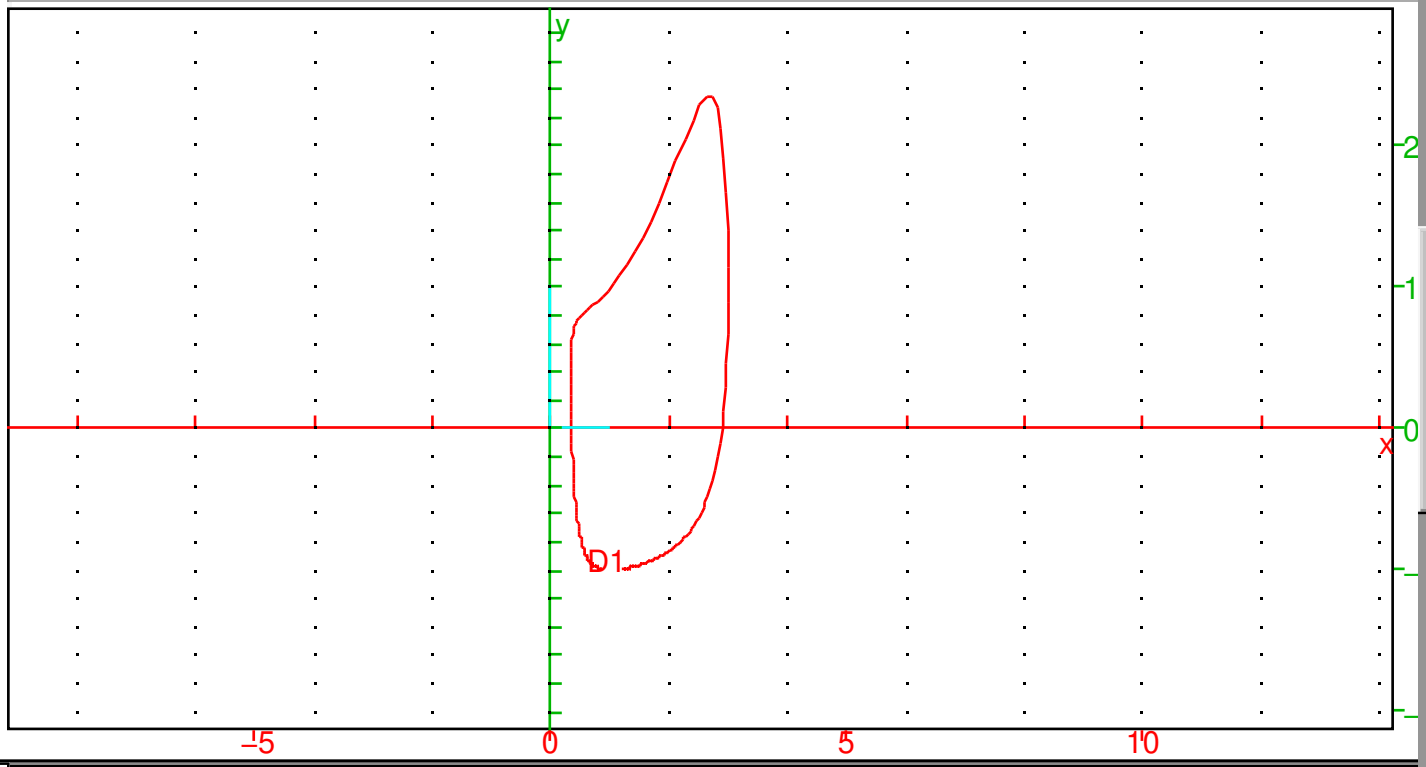
5
```
P2:=denom(yt)*y-numer(yt);
```
$$y*(t^4+t+1)+t^4-t^2-1$$

6
```
P:=resultant(P1,P2,t);
```
$$3*x^4*y^2-22*x^3*y^2+6*x^4*y+4*x^4+44*x^2*y^2-28*x^3*y-8*x^3-10*x*y^2+28*x^2*y-8*x^2+y^2-4*$$

7
```
factor(P); // P irred
```
$$3*y^2*x^4-22*y^2*x^3+44*y^2*x^2-10*y^2*x+y^2+6*y*x^4-28*y*x^3+28*y*x^2-4*y*x-2*y+4*x^4-8*$$

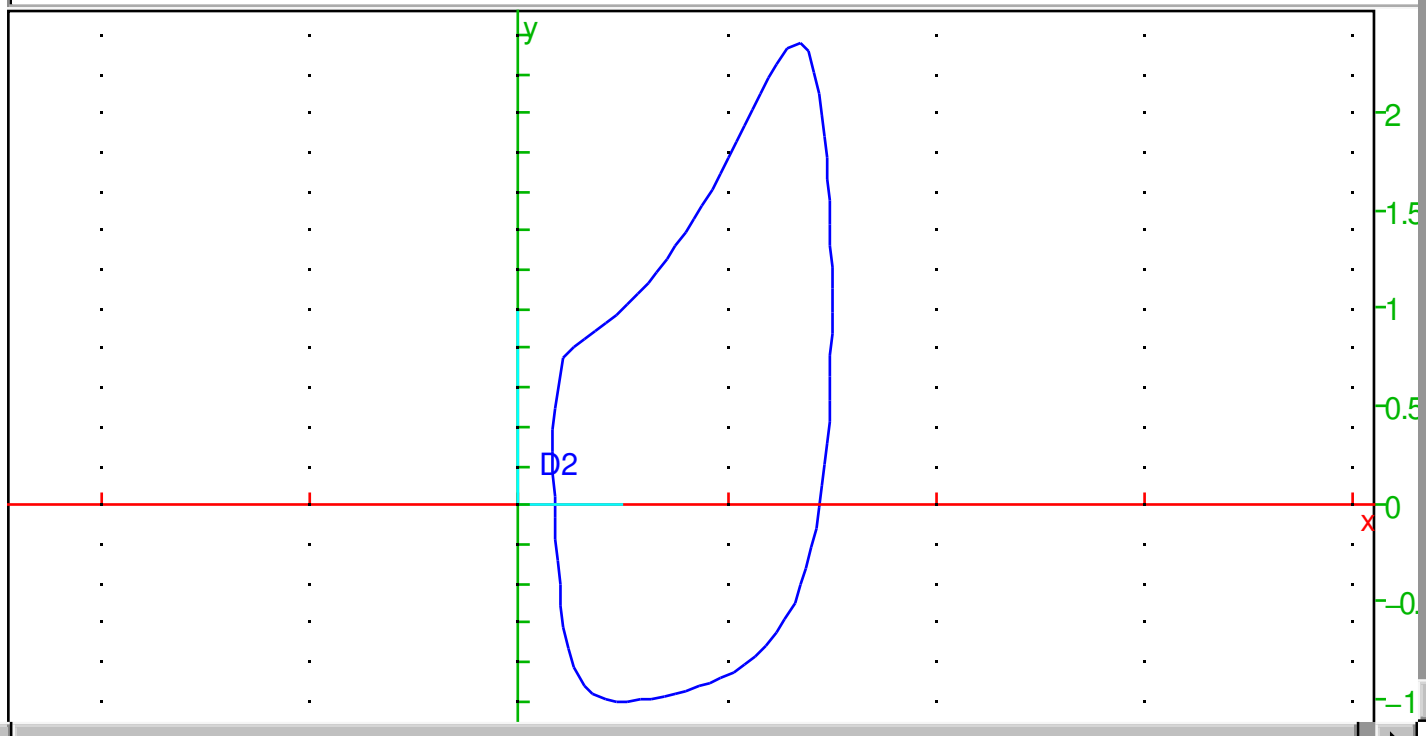
8
```
simplify(unapply(P,x,y)(xt,yt)); // on remplace dans l'equation c'est bien nul
```

9
```
D1:=plotparam([xt,yt],t,display=red);
```

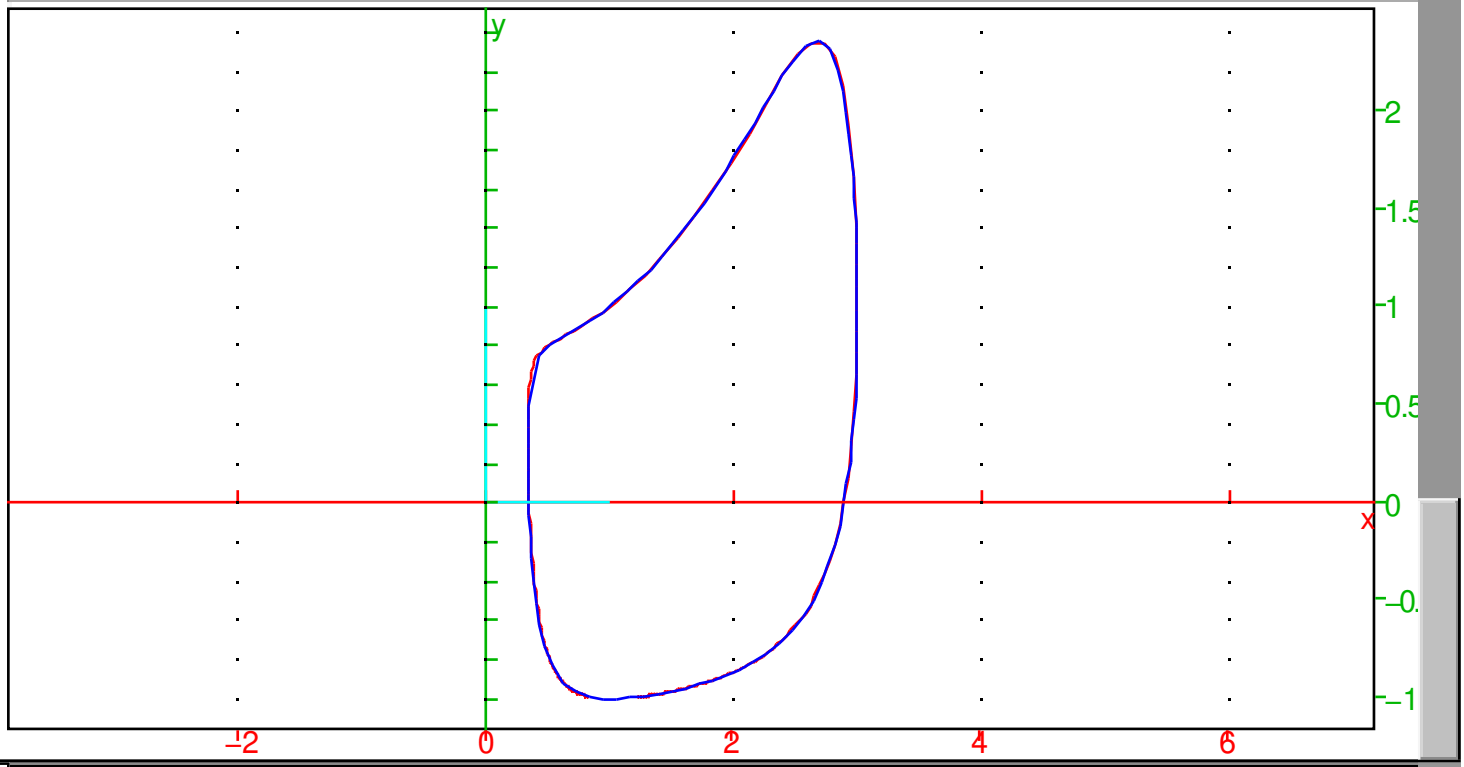


10
```
D2:=plotimplicit(P,[x,y],color=blue);
```

```
// Groebner basis computation time 0.00084 Memory 0.042816M
Proche [-1.64002346689,-0.484861952873], 1/epsilon^2*f([-1.64002346689,-0.484861952873]+epsilon*[1,
Proche [0.135359113305,2.62619806853], 1/epsilon^2*f([0.135359113305,2.62619806853]+epsilon*[1,t])=2
Proche [4.50466435359,-3.14133611566], 1/epsilon^2*f([4.50466435359,-3.14133611566]+epsilon*[1,t])=-
Point singuliers, directions:[no_cellule_horiz,no_cellule_vertical,singularite,vers la prochaine solution][]
```



11
```
D1,D2;
```



12
```
prem(a,n):={ local J,j;
  J:=[];
  for(j:=0; j<n ; j++){
    a:=nextprime(a);
    J:=append(J, a);
  }
  return J;
};
```

```
// Interprète prem
// Succès
// lors de la compilation prem
^@^@
```

```
(a,n)->
{ local J,j;
  J:=[];
  for (j:=0;j<n;j++) {
     a:=nextprime(a);
     J:=append(J,a);
    };
  return(J);
}
```

13
```
L0:=prem(15,20);
```

```
[17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101 ]
```

14
```
partie(m,L):={ local n,j,K;
  n:=len(L); K:=[ ]; j:=0;
  while(m>0){
    if(irem(m,2) ==1){ K:=append(K,L[j])}
    j:=j+1;
    m:=iquo(m,2);
  }
  return K;
 }
```

```
// Interprète partie
// Succès
// lors de la compilation partie
^@^@
```

```
(m,L)->
{ local n,j,K;
  n:=len(L);
  K:=[];
  j:=0;
  while(m>0){
     if (((irem(m,2))==1)) K:=append(K,L[j]); ;
     j:=j+1;
     m:=iquo(m,2);
   };; ;
  return(K);
}
```

15
```
partie(311433, L0);
```

```
[17, 29, 43, 73, 79, 97 ]
```

16
```
carmi(L):={
  local N,n,j,m,K,b,Lcarmi;
  n:=len(L);
  Lcarmi:=[];
  for(m:=0; m<2^n; m++){
    K:=partie(m,L);
    if(len(K)>1){
       N:=product(K);
       b:=vrai;
       for(j:=0;j<len(K);j++){
         if(irem(N-1,K[j]-1)!= 0){ b:=faux ; break;}
       }
       if(b) {Lcarmi:=append(Lcarmi,N);}
     }
   }
   return Lcarmi;
  }
```

```
// Interprète carmi
// Succès
// lors de la compilation carmi
^@^@
```

```
(L)->
{ local N,n,j,m,K,b,Lcarmi;
  n:=len(L);
  Lcarmi:=[];
  for (m:=0;m<(2^n);m++) {
     K:=partie(m,L);
     if ((len(K))>1) {
        N:=product(K);
        b:=vrai;
        for (j:=0;j<(len(K));j++) if ((irem(N-1,K[j]-1))<>0) {
           b:=faux;
```

```
                    };;;
                  if (b) Lcarmi:=append(Lcarmi,N);;
                };;
              };
            return(Lcarmi);
          }
```

17

undef

18

$$\begin{vmatrix} \frac{2}{5}, & \frac{1}{5}, & 0, & \frac{4}{5} \\ 0, & \frac{3}{5}, & \frac{1}{5}, & 0 \\ 0, & \frac{1}{5}, & \frac{1}{2}, & \frac{1}{10} \\ \frac{3}{5}, & 0, & \frac{3}{10}, & \frac{1}{10} \end{vmatrix}$$

19

```
jordan(A); // en exact cela donne des rootof assez lourd
```

$$\left(\begin{array}{l} 11, \quad \text{rootof}([[-6,0,51093750000,0,-96459960937500000000],[1,0,-8906250000,0,19830322265625000000, \\ 1, \quad 1538085937500000000, \\ 2, \quad \text{rootof}([[-1,0,7421875000,0,-11889648437500000000],[1,0,-8906250000,0,19830322265625000000,0 \\ 8, \quad \text{rootof}([[7,0,-58515625000,0,106811523437500000000],[1,0,-8906250000,0,19830322265625000000, \end{array} \right)$$

20

```
jordan(approx(A)); // l'enonce suggere plutot d'etre en valeurs approchees
```

$$\left(\begin{vmatrix} 0.798023875121, & 0.677229405997, & 0.732561560972, & -0.302681682318 \\ 0.072547625011, & -0.0145587862888, & -0.754862011616, & -0.621084443098 \\ 0.145095250022, & 0.078615133057, & -0.461529028526, & 0.752485625216 \\ 0.580381000088, & -0.741285752765, & 0.483829479169, & 0.1712805002 \end{vmatrix}, \begin{vmatrix} 1.0, & 0, \\ 0, & -0.479968226708, \\ 0, & 0, \\ 0, & 0, \end{vmatrix} \right)$$

21

```
PA:=factor(pcar(A,x));
```

$$\frac{(x-1)*(250*x^3-150*x^2-65*x+31)}{250}$$

22

```
gcd(PA,diff(PA,x));
```

1

23

```
proot(PA);
```

[−0.479968226708, 0.357686532458, 0.72228169425, 1.0]

24

```
matpow(A,n); // ne pas utiliser matpow en valeurs approchees. Mais ici on exact c'est
```

(76904296875000000000

99667292833328247070312500000000000000000

rootof([[1,37500,−7421875000,−319335937500000,4199218750000000000,1510620117187500000000000],

rootof([[73,−1512500,−541796875000,8231445312500000,82949218750000000000,−6896057128906250

rootof([[1,0,−7421875000,−123046875000000,1188964843750000000],[1,0,−8906250000,0,198303222€

(153808593750000000000

311460290104150772094726562

rootof([[−1,37500,7421875000,−319335937500000,−4199218750000000000,1510620117187500000000

rootof([[−73,−1512500,541796875000,8231445312500000,−82949218750000000000,−689605712890625

rootof([[1,0,−7421875000,123046875000000,1188964843750000000],[1,0,−8906250000,0,1983032226

(153808593750000000000

311460290104150772094726562

rootof([[121,0,−658515625000,0,2571411132812500000000],[1,0,−8906250000,0,198303222656250000000,

rootof([[−1,0,7421875000,0,−727539062500000000],[1,0,−8906250000,0,19830322265625000000,0,−80

(76904296875000000000

6479956054687500000000

rootof([[73,−1512500,−541796875000,8231445312500000,82949218750000000000,−6896057128906250

rootof([[1,0,−7421875000,−123046875000000,1188964843750000000],[1,0,−8906250000,0,198303222€

(153808593750000000000

16199890136718750

rootof([[−73,−1512500,541796875000,8231445312500000,−82949218750000000000,−689605712890625

rootof([[1,0,−7421875000,123046875000000,1188964843750000000],[1,0,−8906250000,0,1983032226

(153808593750000000000

16199890136718750

rootof([[−1,0,7421875000,0,−1188964843750000000],[1,0,−8906250000,0,19830322265625000000,0,−80

rootof([[121,0,−658515625000,0,2571411132812500000000],[1,0,−8906250000,0,198303222656250000000,

25

```
ker(A-idn(4));
```

$$\left[-\frac{11}{8}, -\frac{1}{8}, -\frac{1}{4}, -1 \right]$$

26

```
transpose(egv(A))[0]; // le premier vecteur propre car attention egv donne la matrice
```

[11, 1, 2, 8]

27