

```
1 root:=maple_mode(0); evalf(0.001010101025 [1 50 0 25] 0.0.0);
```

Warning: some commands like subs might change arguments order

2 Attention pour les utilisateurs de maple, root[3](23) ne marche pas, il fait juste racine

```
3 root(3,23);
```

$$23^{\frac{1}{3}}$$

```
4 surd(23,3); //c'est plutot celui ci que l'on trouve dans la doc
```

$$23^{\frac{1}{3}}$$

```
5 root(3,23.); evalf(root(3,23.)); root(3, approx(23));
```

Warning: some commands like subs might change arguments order

```
6 evalf(Pi,1000); approx(Pi,1000);
```

3.141592653589793238462643383279502884197169399375105820974944592

```
7 maple_mode(0); evalf(E); evalf(e);
```

Warning: some commands like subs might change arguments order

```
8 maple_mode(1); evalf(E); evalf(e); evalf(exp(1));
```

Warning: some commands like subs might change arguments order

```
9 maple_mode(0);
```

Warning: some commands like subs might change arguments order

10 Attention mettre plusieurs Digits:= sur une meme ligne a l'air de poser probleme?

```
11 Digits:=1000;
```

1000

```
12 sqrt(2.0);
```

1.414213562373095048801688724209698078569671875376948073176679737

```
13 Digits:=10;
```

10

```
14 sqrt(3.0);
```

1.732050808

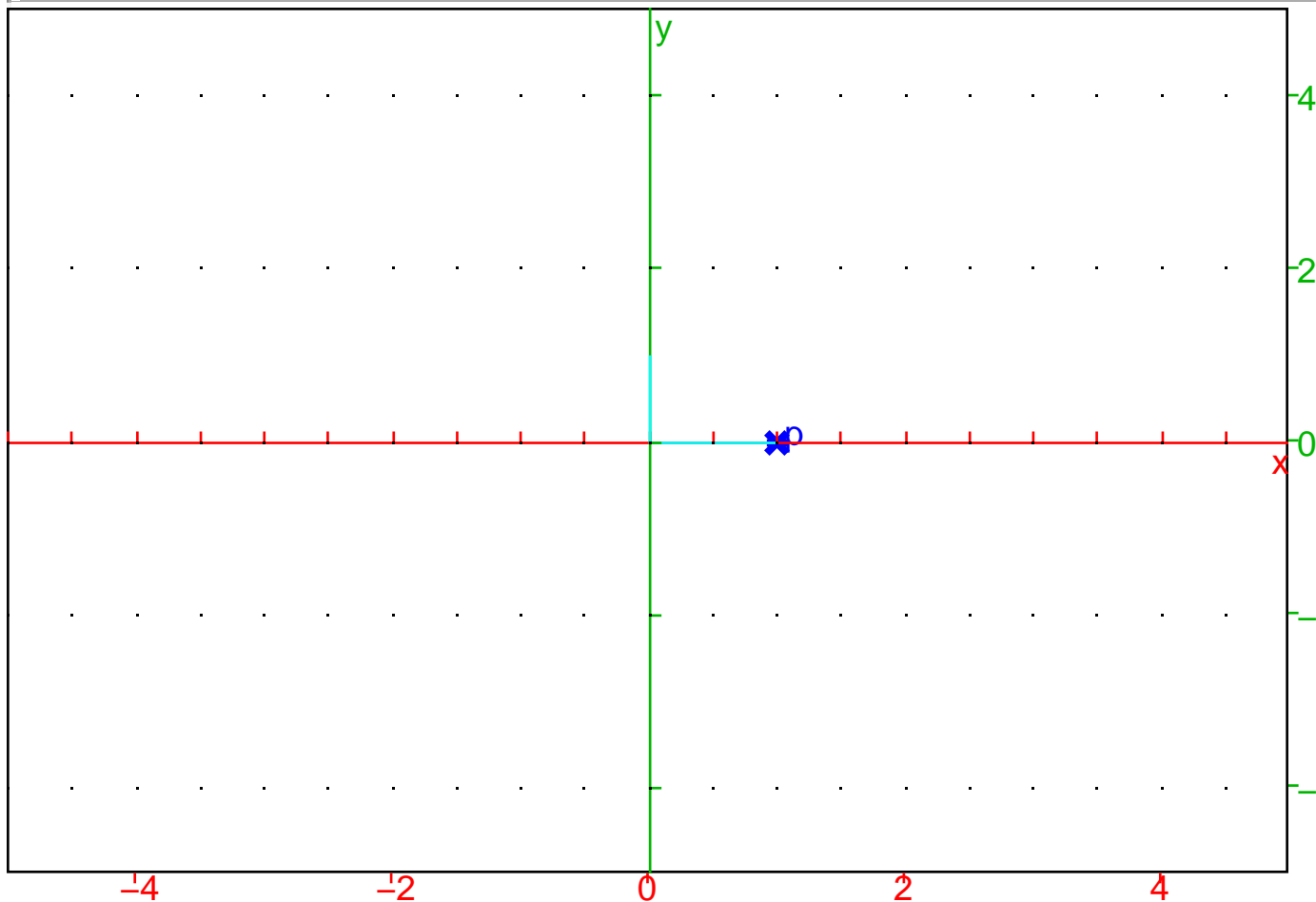
EXERCICE

```
16 l:= [1,33,4];
```

17	<code>augment(1,55);</code>	$[1, 33, 4, 55]$
18	<code>a:=11111;</code>	11111
19	<code>purge(a);</code>	11111
20	<code>a;</code>	$a$
21	<code>pp1:=44*atan(1/57)+7*atan(1/239)-12*atan(1/682)+24*atan(1/12943);</code>	$24 * \operatorname{atan}\left(\frac{1}{12943}\right) + 7 * \operatorname{atan}\left(\frac{1}{239}\right) + 44 * \operatorname{atan}\left(\frac{1}{57}\right) - 12 * \operatorname{atan}\left(\frac{1}{682}\right)$
22	<code>simplify(pp1); //ou peut etre tsimplify</code>	$\frac{1}{4} * \pi$
23	<code>l2:=[11,133,14];</code>	$[11, 133, 14]$
24	<code>concat(11,l2);</code>	$[11, 11, 133, 14]$
25	<code>a:=exp(i*pi/5);</code>	$\frac{i * (\sqrt{-2 * (\sqrt{5} + 10)}}{4} + \frac{\sqrt{5} + 1}{4}$
26	<code>simplify(a+exp(i*pi/3));</code>	$\operatorname{rootof}([5307 - 13074 * i, 4234 - 7853 * i, -693883 + 1729870 * i, 298410 - 1005795 * i,$
27	<code>simplify(7^(1/3)+sqrt(5));</code>	

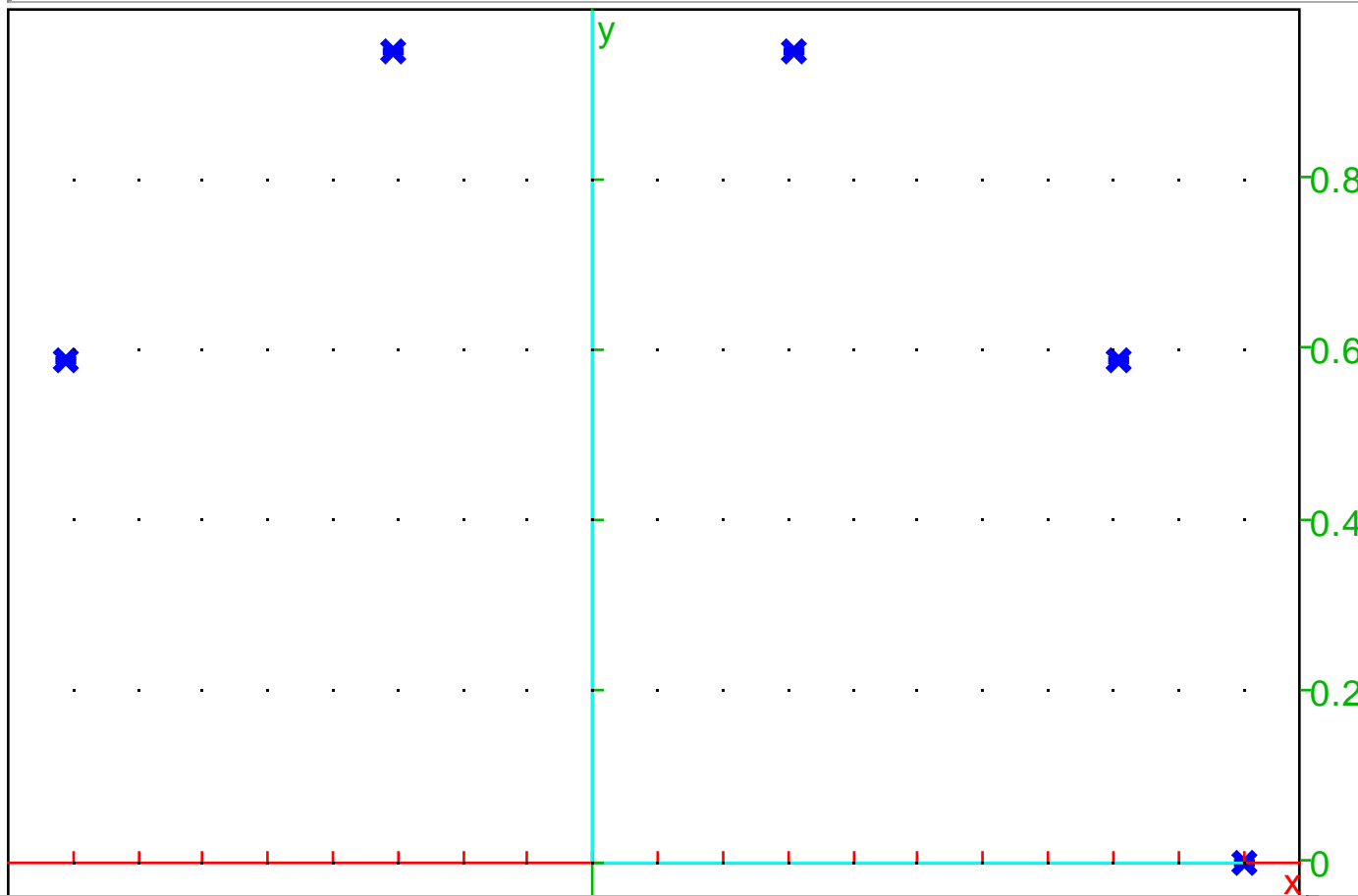
28

```
p:=point(1,display=bleu+epaisseur_point_3+point_etoile);
```



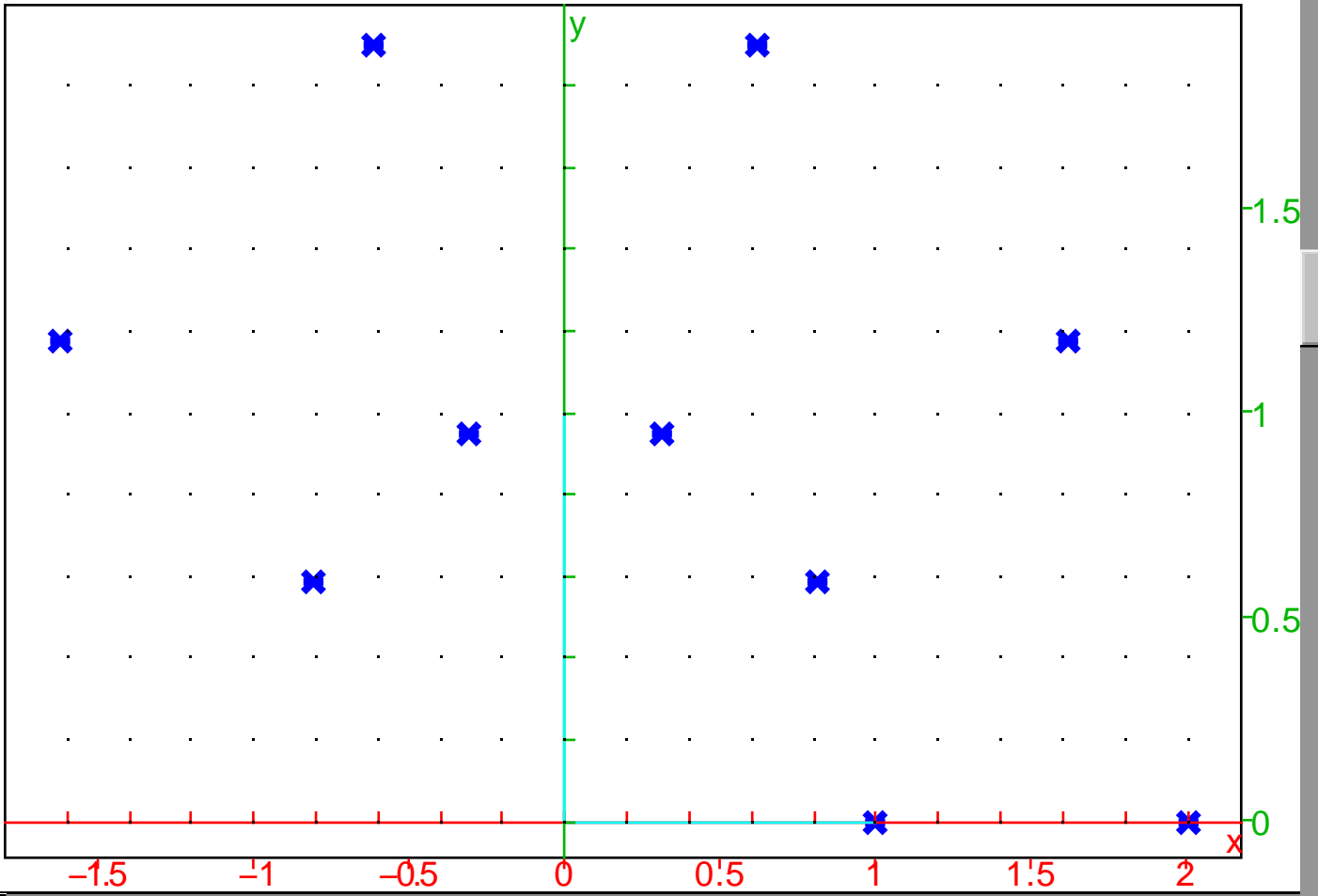
29

```
seq(p*a^j,j=0..4);
```



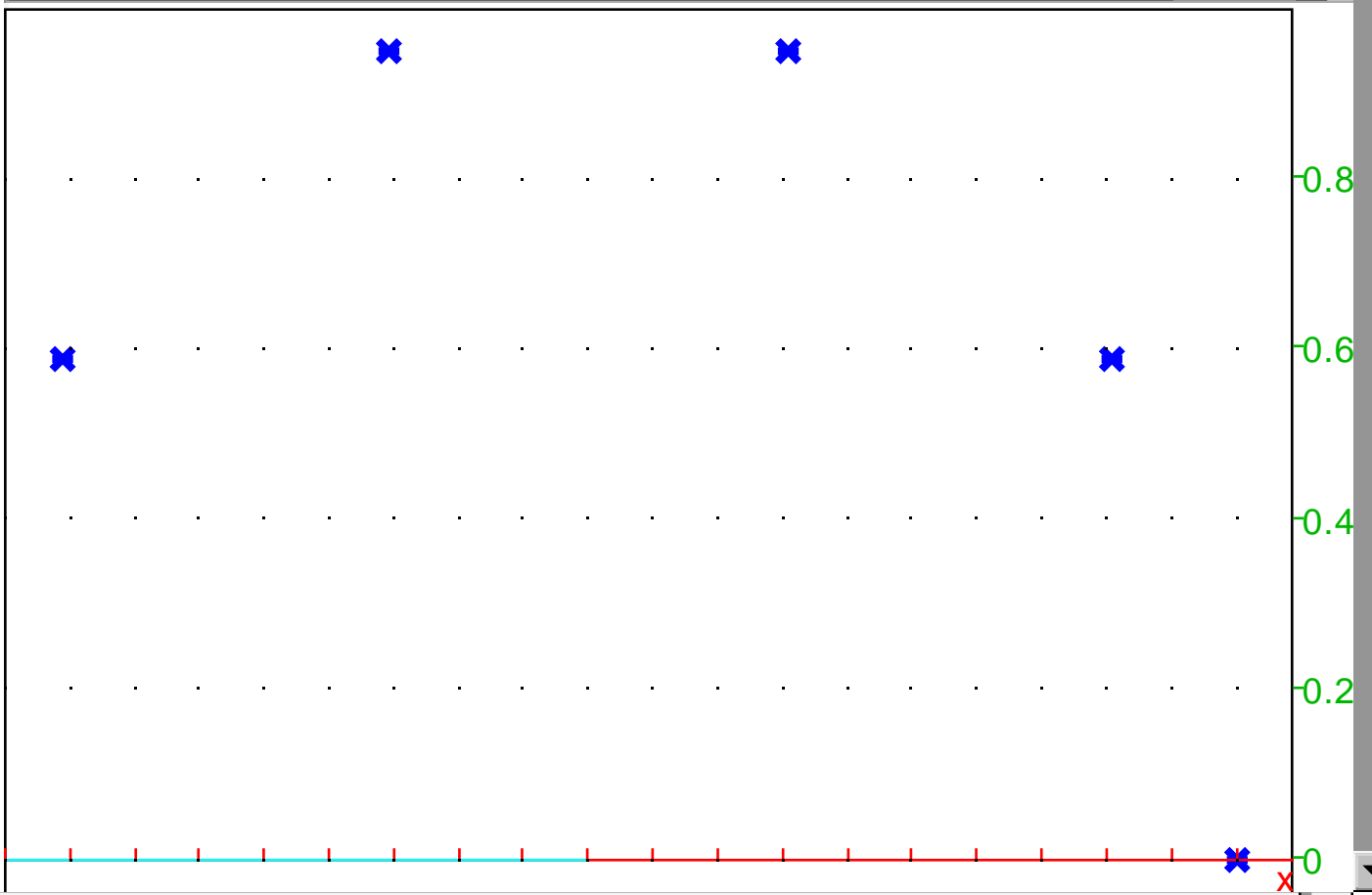
30

```
[seq(p*a^j, j=0..4)]; [seq(p*a^j, j=0..4)]*2;
```



31

```
[seq(p*a^j, j=0..4)]; [seq(p*a^j, j=0..4)]*2;
```



32 1\_(dm^3)+3\_c1; //On ajoute 2 volumes.

$$1.03_{dm}^3$$

33 **purge**(x); // pour etre sur que x est libre.

No such variable x

34 **is**(x); //renv 1 si x est libre. Car dans ce cas, x il coincide avec la

vrai

35 P:=x/(x^2+1);

$$\frac{x}{x^2 + 1}$$

36 Q:=x->**sin**(1/x);

// Succès  
// End defining Q

$$x \rightarrow \sin\left(\frac{1}{x}\right)$$

37 **type**(P); //un symbole

DOM\_SYMBOLIC

38 **type**(Q); //une fonction

DOM\_FUNC

39 **type**(Q(x)); //un symbole

DOM\_SYMBOLIC

40 **type**(Q(5)); //un symbole car sin(1/5) est laisse tel quel

DOM\_SYMBOLIC

41 **type**(**normal**(Q(6/pi))); // un rationnel car c'est une valeur remarquable

DOM\_RAT

42 **diff**(P,x);

$$-\frac{2*x^2}{(x^2 + 1)^2} + \frac{1}{x^2 + 1}$$

43 **function\_diff**(Q);

// Succès

$$'x' \rightarrow \frac{\cos\left(\frac{1}{x}\right)}{x^2}$$

44

Q' ;

$$x \rightarrow \frac{\cos\left(\frac{1}{x}\right)}{x^2}$$

45

(Q@@7)(y) ;

$$\sin\left(\frac{1}{\sin\left(\frac{1}{\sin\left(\frac{1}{\sin\left(\frac{1}{\sin\left(\frac{1}{\sin\left(\frac{1}{\sin\left(\frac{1}{\sin\left(\frac{1}{y}\right)}\right)}\right)}\right)}\right)}\right)}\right)}\right)$$

46

`unapply(P,x); // cr\ee la fonction P`

$$x \rightarrow \frac{x}{x^2 + 1}$$

47

`simplify(diff(unapply(P,x)(0))); // cr\ee la fonction P et la`

// Succès

$$x \rightarrow \frac{\cos\left(\frac{1}{x}\right)^3}{x^2 * \cos\left(\frac{1}{x}\right)^4 - 4 * x^2 * \cos\left(\frac{1}{x}\right)^2 + 4 * x^2}$$

48

`simplify(diff(sin(1/x)/(sin(1/x)^2+1),x)); //verif`

$$-\frac{\cos\left(\frac{1}{x}\right)^3}{x^2 * \cos\left(\frac{1}{x}\right)^4 - 4 * x^2 * \cos\left(\frac{1}{x}\right)^2 + 4 * x^2}$$

49

`f(x):=1/(2+x);u(n):=simplify((f@@n)(0));l:=sqrt(2)-1;`

// Interprète f

// Succès lors de la compilation f

// Interprète u

Warning, une fonction algébrique définie par d'autres fonctions peut conduire à des e

Vous voulez dire peut être u:=unapply(simplify((f@@n)(0)),n)

// Attention: f, déclarée(s) comme variable(s) globale(s) lors de la compilation u

$$\left( x \rightarrow \frac{1}{2+x}, n \rightarrow \text{simplify}(f@@n(0)), \sqrt{2}-1 \right)$$

50

`seq(approx(approx(1-u(n),200),4),n=10..150)`

[1.073e-08, -1.84e-09, 3.158e-10, -5.418e-11, 9.296e-12, -1.595e-12, 2.736e-13]

51

```
best(n) := {
  local a,b,a0,b0,l,d,m;
  a0:=1;b0:=1;l:=sqrt(2)-1;
  d:=denom(u(n));m:=abs(a0/b0-1)
  for (b:=1;b<=d;b++) {
    for (a:=1;a<b;a++) {
      if (abs(a/b-1)<m) {
        m:=abs(a/b-1);
        a0:=a;b0:=b;
      }
    }
  }
  return [a0,b0];
}
```

```
(n)->
{ local a,b,a0,b0,l,d,m;
  a0:=1;
  b0:=1;
  l:=sqrt(2)-1;
  d:=denom(u(n));
  m:=abs(a0/b0-1);
  for (b:=1;b<=d;b++) for (a:=1;a<b;a++) if ((abs(a/b-1)<m) {
    m:=abs(a/b-1);
    a0:=a;
    b0:=b;
  };;;
  return([a0,b0]);
}
```

53 best(4);u(4)

( [12, 29 ],  $\frac{12}{29}$  )

54 best(5);u(5)

( [29, 70 ],  $\frac{29}{70}$  )

55 best(6);u(6)

( [70, 169 ],  $\frac{70}{169}$  )

56 best(7);u(7) // Attention, le denominateur augmente tres tres vite.

Temps mis pour l'évaluation: 2.12

( [169, 408 ],  $\frac{169}{408}$  )

57 ————— EXERCICE —————





63 On constate que le coefficient de  $t^n$  est la somme de tous les monomes de degre  $n$  en les 4 variables  $a,b,c,d$ . Ces monomes sont en bijections avec les suites croissantes (au sens large) de  $n$  el'elements de  $\{1,2,3,4\}$ .

64 `coeff(s,t^3);`

3 3 3 3 2 2 2 2 2 2 2 2

65 Pour r'esoudre ce Pb on met des poids aux variables. Ex:  $a,d$  de degre 1,  $b$ : 3,  $c$ : 2, et  $f$ : 4. et l'on cherche les monomes de degres 208.

66

undef

67 `P:=1/((1-a*t)*(1-b*t^3)*(1-c*t^2)*(1-d*t)*(1-f*t^4));`

$$\frac{1}{(-a*t+1)*(-b*t^3+1)*(-c*t^2+1)*(-d*t+1)*(-t^4*(x \rightarrow \frac{1}{2+x})+1)}$$

68 `s:=series(P,t=0,4);;`

"Développement en séries incorrect: Plusieurs args: à implementer

69 `coeff(s,t^4); //Ex on verifie bien que f a un poids de 4`

order\_size(t)

70 `P:=1/((1-t)*(1-t^3)*(1-t^2)*(1-t)*(1-t^4));`

$$\frac{1}{(-t+1)^2*(-t^2+1)*(-t^3+1)*(-t^4+1)}$$

71 `s:=series(P,t=0,208);;`

Done

72 `coeff(s,t^208);`

3605967

73 Pour calculer le coefficient de  $t^n$ , seuls les termes en  $1/(1-t^i)$  pour  $i < n+1$  du produit vont contribuer, on n'a donc pas besoin du produit infini pour  $n$  fixe

74 `P:=n->mul(1/(1-t^j),j=1..n);`

// Attention: t,j, déclarée(s) comme variable(s) globale(s)  
// End defining P

$$n \rightarrow \text{mul}\left(\frac{1}{1-t^j}, j = (1 \dots n)\right)$$

75 On cherche donc le coefficient de  $t^{50}$  dans:

```
76 series (P(50),t,0,50);
```

$$1 + t + 2t^2 + 3t^3 + 5t^4 + 7t^5 + 11t^6 + 15t^7 + 22t^8 + 30t^9 + 42t^{10} + 56t^{11} + 627t^{20} + 792t^{21} + 1002t^{22} + 1255t^{23} + 1575t^{24} + 1958t^{25} + 2436t^{26} + 3010t^{27} + 3733t^{28} + 4485t^{29} + 5295t^{30} + 6165t^{31} + 7095t^{32} + 8085t^{33} + 9135t^{34} + 10245t^{35} + 11415t^{36} + 12645t^{37} + 13935t^{38} + 15285t^{39} + 16695t^{40} + 18165t^{41} + 19695t^{42} + 21285t^{43} + 22935t^{44} + 24645t^{45} + 26415t^{46} + 28245t^{47} + 30135t^{48} + 32085t^{49}$$

```
77 coeff (series (P(50),t,0,50),t^50);
```

204226

```
78 l:=normal ((a+b+c+d)^8);
```

$$a^8 + b^8 + c^8 + d^8 + 8a^7b + 8a^7c + 8a^7d + 8b^7c + 8b^7d + 8c^7d + 28a^6b^2 + 28a^6c^2 + 28a^6d^2 + 70a^5b^3 + 70a^5c^3 + 70a^5d^3 + 56a^4b^4 + 56a^4c^4 + 56a^4d^4 + 168a^3b^5 + 168a^3c^5 + 168a^3d^5 + 280a^2b^6 + 280a^2c^6 + 280a^2d^6 + 420a^2b^4c^2 + 420a^2b^4d^2 + 168a^2b^5c + 168a^2b^5d + 420a^2c^4d + 280a^3c^3d + 560a^3b^2c^3 + 560a^3b^2d^3 + 560a^3b^3c^2 + 560a^3b^3d^2 + 280a^4b^2c^2 + 280a^4b^2d^2 + 168a^5b^2c + 168a^5b^2d + 168a^5c^2d + 560a^4b^3c + 560a^4b^3d + 280a^5b^3c^2 + 280a^5b^3d^2 + 168a^5b^4c + 168a^5b^4d + 168a^5c^3d + 560a^4b^4c + 560a^4b^4d + 280a^5b^4c^2 + 280a^5b^4d^2 + 168a^5b^5c + 168a^5b^5d + 168a^5c^4d + 560a^4b^5c + 560a^4b^5d + 280a^5b^5c^2 + 280a^5b^5d^2 + 168a^5b^6c + 168a^5b^6d + 168a^5c^5d + 560a^4b^6c + 560a^4b^6d + 280a^5b^6c^2 + 280a^5b^6d^2 + 168a^5b^7c + 168a^5b^7d + 168a^5c^6d + 560a^4b^7c + 560a^4b^7d + 280a^5b^7c^2 + 280a^5b^7d^2 + 168a^5b^8c + 168a^5b^8d + 168a^5c^7d + 560a^4b^8c + 560a^4b^8d + 280a^5b^8c^2 + 280a^5b^8d^2 + 168a^5b^9c + 168a^5b^9d + 168a^5c^8d + 560a^4b^9c + 560a^4b^9d + 280a^5b^9c^2 + 280a^5b^9d^2 + 168a^5b^{10}c + 168a^5b^{10}d + 168a^5c^9d + 560a^4b^{10}c + 560a^4b^{10}d + 280a^5b^{10}c^2 + 280a^5b^{10}d^2 + 168a^5b^{11}c + 168a^5b^{11}d + 168a^5c^{10}d + 560a^4b^{11}c + 560a^4b^{11}d + 280a^5b^{11}c^2 + 280a^5b^{11}d^2 + 168a^5b^{12}c + 168a^5b^{12}d + 168a^5c^{11}d + 560a^4b^{12}c + 560a^4b^{12}d + 280a^5b^{12}c^2 + 280a^5b^{12}d^2 + 168a^5b^{13}c + 168a^5b^{13}d + 168a^5c^{12}d + 560a^4b^{13}c + 560a^4b^{13}d + 280a^5b^{13}c^2 + 280a^5b^{13}d^2 + 168a^5b^{14}c + 168a^5b^{14}d + 168a^5c^{13}d + 560a^4b^{14}c + 560a^4b^{14}d + 280a^5b^{14}c^2 + 280a^5b^{14}d^2 + 168a^5b^{15}c + 168a^5b^{15}d + 168a^5c^{14}d + 560a^4b^{15}c + 560a^4b^{15}d + 280a^5b^{15}c^2 + 280a^5b^{15}d^2 + 168a^5b^{16}c + 168a^5b^{16}d + 168a^5c^{15}d + 560a^4b^{16}c + 560a^4b^{16}d + 280a^5b^{16}c^2 + 280a^5b^{16}d^2 + 168a^5b^{17}c + 168a^5b^{17}d + 168a^5c^{16}d + 560a^4b^{17}c + 560a^4b^{17}d + 280a^5b^{17}c^2 + 280a^5b^{17}d^2 + 168a^5b^{18}c + 168a^5b^{18}d + 168a^5c^{17}d + 560a^4b^{18}c + 560a^4b^{18}d + 280a^5b^{18}c^2 + 280a^5b^{18}d^2 + 168a^5b^{19}c + 168a^5b^{19}d + 168a^5c^{18}d + 560a^4b^{19}c + 560a^4b^{19}d + 280a^5b^{19}c^2 + 280a^5b^{19}d^2 + 168a^5b^{20}c + 168a^5b^{20}d + 168a^5c^{19}d + 560a^4b^{20}c + 560a^4b^{20}d + 280a^5b^{20}c^2 + 280a^5b^{20}d^2 + 168a^5b^{21}c + 168a^5b^{21}d + 168a^5c^{20}d + 560a^4b^{21}c + 560a^4b^{21}d + 280a^5b^{21}c^2 + 280a^5b^{21}d^2 + 168a^5b^{22}c + 168a^5b^{22}d + 168a^5c^{21}d + 560a^4b^{22}c + 560a^4b^{22}d + 280a^5b^{22}c^2 + 280a^5b^{22}d^2 + 168a^5b^{23}c + 168a^5b^{23}d + 168a^5c^{22}d + 560a^4b^{23}c + 560a^4b^{23}d + 280a^5b^{23}c^2 + 280a^5b^{23}d^2 + 168a^5b^{24}c + 168a^5b^{24}d + 168a^5c^{23}d + 560a^4b^{24}c + 560a^4b^{24}d + 280a^5b^{24}c^2 + 280a^5b^{24}d^2 + 168a^5b^{25}c + 168a^5b^{25}d + 168a^5c^{24}d + 560a^4b^{25}c + 560a^4b^{25}d + 280a^5b^{25}c^2 + 280a^5b^{25}d^2 + 168a^5b^{26}c + 168a^5b^{26}d + 168a^5c^{25}d + 560a^4b^{26}c + 560a^4b^{26}d + 280a^5b^{26}c^2 + 280a^5b^{26}d^2 + 168a^5b^{27}c + 168a^5b^{27}d + 168a^5c^{26}d + 560a^4b^{27}c + 560a^4b^{27}d + 280a^5b^{27}c^2 + 280a^5b^{27}d^2 + 168a^5b^{28}c + 168a^5b^{28}d + 168a^5c^{27}d + 560a^4b^{28}c + 560a^4b^{28}d + 280a^5b^{28}c^2 + 280a^5b^{28}d^2 + 168a^5b^{29}c + 168a^5b^{29}d + 168a^5c^{28}d + 560a^4b^{29}c + 560a^4b^{29}d + 280a^5b^{29}c^2 + 280a^5b^{29}d^2 + 168a^5b^{30}c + 168a^5b^{30}d + 168a^5c^{29}d + 560a^4b^{30}c + 560a^4b^{30}d + 280a^5b^{30}c^2 + 280a^5b^{30}d^2 + 168a^5b^{31}c + 168a^5b^{31}d + 168a^5c^{30}d + 560a^4b^{31}c + 560a^4b^{31}d + 280a^5b^{31}c^2 + 280a^5b^{31}d^2 + 168a^5b^{32}c + 168a^5b^{32}d + 168a^5c^{31}d + 560a^4b^{32}c + 560a^4b^{32}d + 280a^5b^{32}c^2 + 280a^5b^{32}d^2 + 168a^5b^{33}c + 168a^5b^{33}d + 168a^5c^{32}d + 560a^4b^{33}c + 560a^4b^{33}d + 280a^5b^{33}c^2 + 280a^5b^{33}d^2 + 168a^5b^{34}c + 168a^5b^{34}d + 168a^5c^{33}d + 560a^4b^{34}c + 560a^4b^{34}d + 280a^5b^{34}c^2 + 280a^5b^{34}d^2 + 168a^5b^{35}c + 168a^5b^{35}d + 168a^5c^{34}d + 560a^4b^{35}c + 560a^4b^{35}d + 280a^5b^{35}c^2 + 280a^5b^{35}d^2 + 168a^5b^{36}c + 168a^5b^{36}d + 168a^5c^{35}d + 560a^4b^{36}c + 560a^4b^{36}d + 280a^5b^{36}c^2 + 280a^5b^{36}d^2 + 168a^5b^{37}c + 168a^5b^{37}d + 168a^5c^{36}d + 560a^4b^{37}c + 560a^4b^{37}d + 280a^5b^{37}c^2 + 280a^5b^{37}d^2 + 168a^5b^{38}c + 168a^5b^{38}d + 168a^5c^{37}d + 560a^4b^{38}c + 560a^4b^{38}d + 280a^5b^{38}c^2 + 280a^5b^{38}d^2 + 168a^5b^{39}c + 168a^5b^{39}d + 168a^5c^{38}d + 560a^4b^{39}c + 560a^4b^{39}d + 280a^5b^{39}c^2 + 280a^5b^{39}d^2 + 168a^5b^{40}c + 168a^5b^{40}d + 168a^5c^{39}d + 560a^4b^{40}c + 560a^4b^{40}d + 280a^5b^{40}c^2 + 280a^5b^{40}d^2 + 168a^5b^{41}c + 168a^5b^{41}d + 168a^5c^{40}d + 560a^4b^{41}c + 560a^4b^{41}d + 280a^5b^{41}c^2 + 280a^5b^{41}d^2 + 168a^5b^{42}c + 168a^5b^{42}d + 168a^5c^{41}d + 560a^4b^{42}c + 560a^4b^{42}d + 280a^5b^{42}c^2 + 280a^5b^{42}d^2 + 168a^5b^{43}c + 168a^5b^{43}d + 168a^5c^{42}d + 560a^4b^{43}c + 560a^4b^{43}d + 280a^5b^{43}c^2 + 280a^5b^{43}d^2 + 168a^5b^{44}c + 168a^5b^{44}d + 168a^5c^{43}d + 560a^4b^{44}c + 560a^4b^{44}d + 280a^5b^{44}c^2 + 280a^5b^{44}d^2 + 168a^5b^{45}c + 168a^5b^{45}d + 168a^5c^{44}d + 560a^4b^{45}c + 560a^4b^{45}d + 280a^5b^{45}c^2 + 280a^5b^{45}d^2 + 168a^5b^{46}c + 168a^5b^{46}d + 168a^5c^{45}d + 560a^4b^{46}c + 560a^4b^{46}d + 280a^5b^{46}c^2 + 280a^5b^{46}d^2 + 168a^5b^{47}c + 168a^5b^{47}d + 168a^5c^{46}d + 560a^4b^{47}c + 560a^4b^{47}d + 280a^5b^{47}c^2 + 280a^5b^{47}d^2 + 168a^5b^{48}c + 168a^5b^{48}d + 168a^5c^{47}d + 560a^4b^{48}c + 560a^4b^{48}d + 280a^5b^{48}c^2 + 280a^5b^{48}d^2 + 168a^5b^{49}c + 168a^5b^{49}d + 168a^5c^{48}d + 560a^4b^{49}c + 560a^4b^{49}d + 280a^5b^{49}c^2 + 280a^5b^{49}d^2 + 168a^5b^{50}c + 168a^5b^{50}d + 168a^5c^{49}d + 560a^4b^{50}c + 560a^4b^{50}d + 280a^5b^{50}c^2 + 280a^5b^{50}d^2$$

```
79 coeff (l,[a,b,c,d],[3,2,1,2]);
```

1680

```
80 binomial (8,3)*binomial (5,2)*binomial (3,1);
```

1680

EXERCICE

Pour supprimer/modifier, il suffit de supprimer/editer la ligne correspondante

1 n:=5;

5

2 zs:=exp(2\*i\*Pi/n);

 $((i)\sqrt{2\sqrt{5}+10})/4+(\sqrt{5}-1)/4$ 

3 [seq(point(zs^j,affichage=point\_width\_2),j=0..4)];

Done

4 segment(point(1),point(zs));//un cote du pentagone

segment(point(1,0),point((sqrt(5)-1)/4+(i)\*sqrt(2\*s

5 d1:=droite(point(3),point(3+exp(2\*i\*Pi/3)),'affichage

droite(y=(-sqrt(3)\*x+3\*sqrt(3)))

6 d2:=droite(2\*x+3\*y+1=0);

droite(y=(-2\*x)/3-1/3))

7 A:=inter(d1,d2);

[point(((21-14\*i)\*sqrt(3)+83-63\*i)/23)]

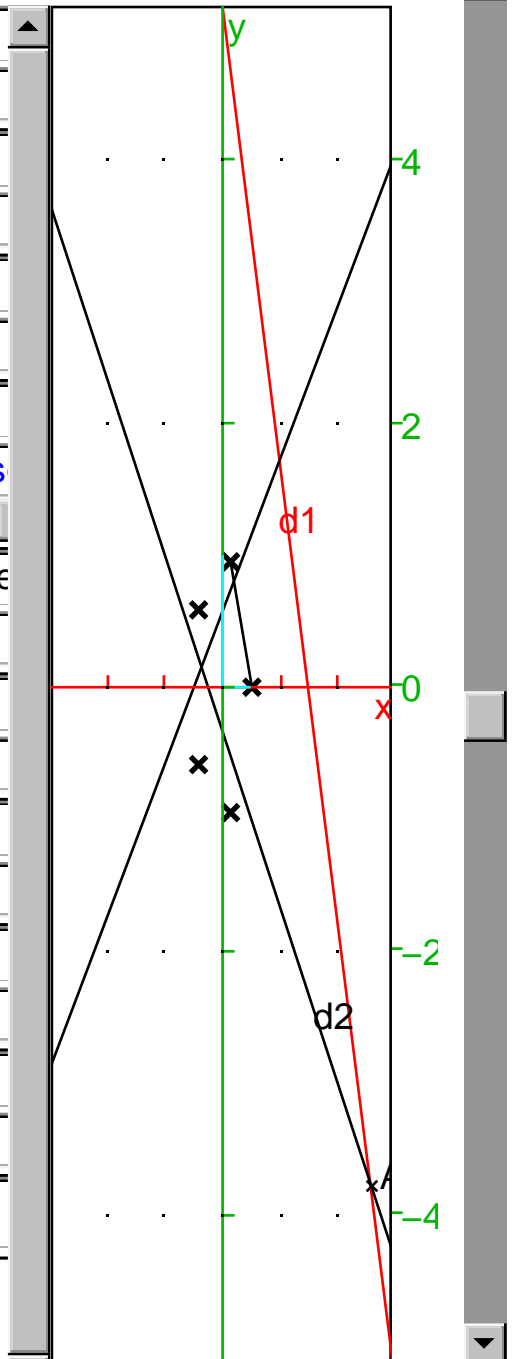
8 t:=element(-5..3);

parameter([t,-5,3,-1,0.08])

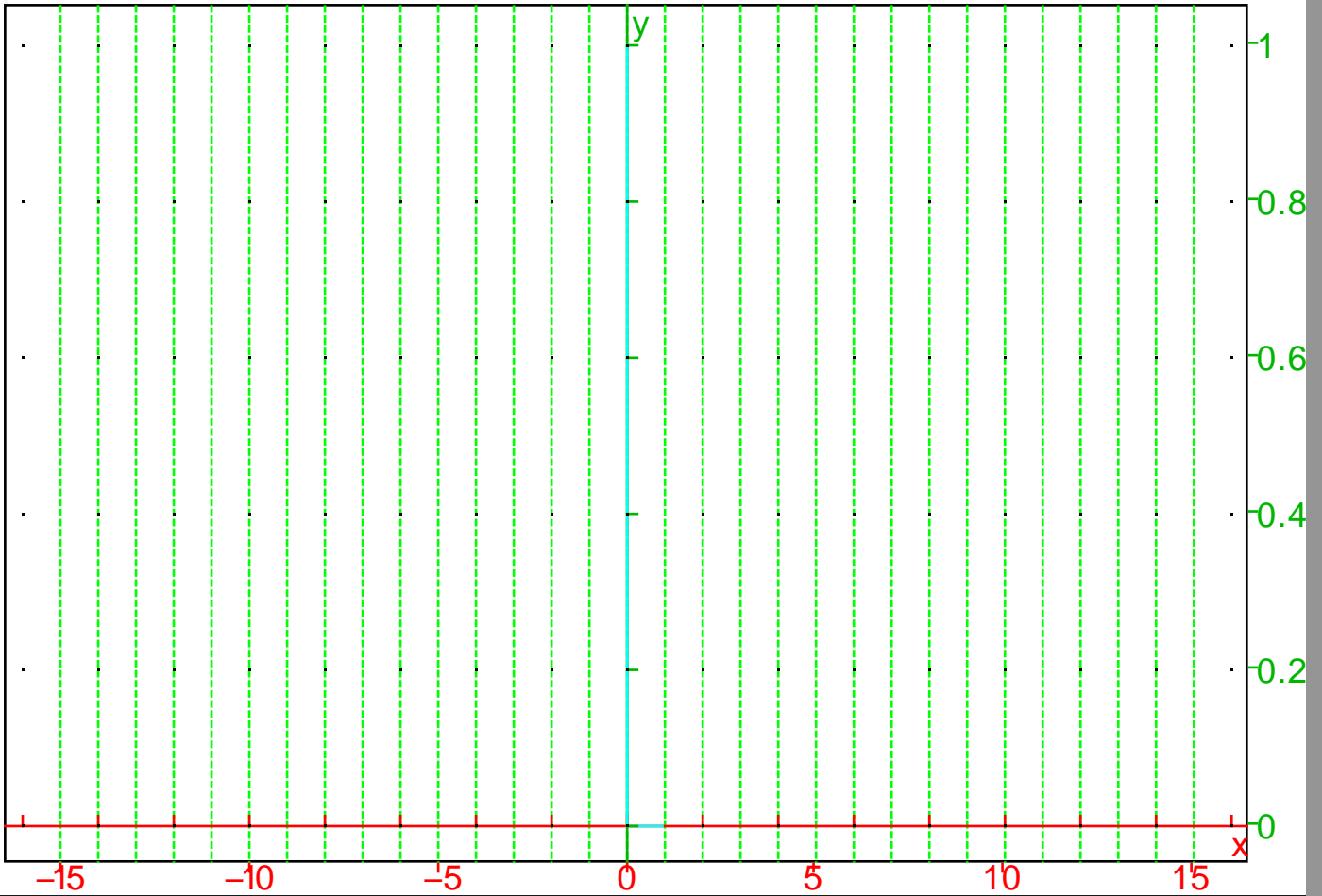
9 perpendiculaire(point(t),d1);

droite(y=((sqrt(3)\*x)/3+(sqrt(3))/3))

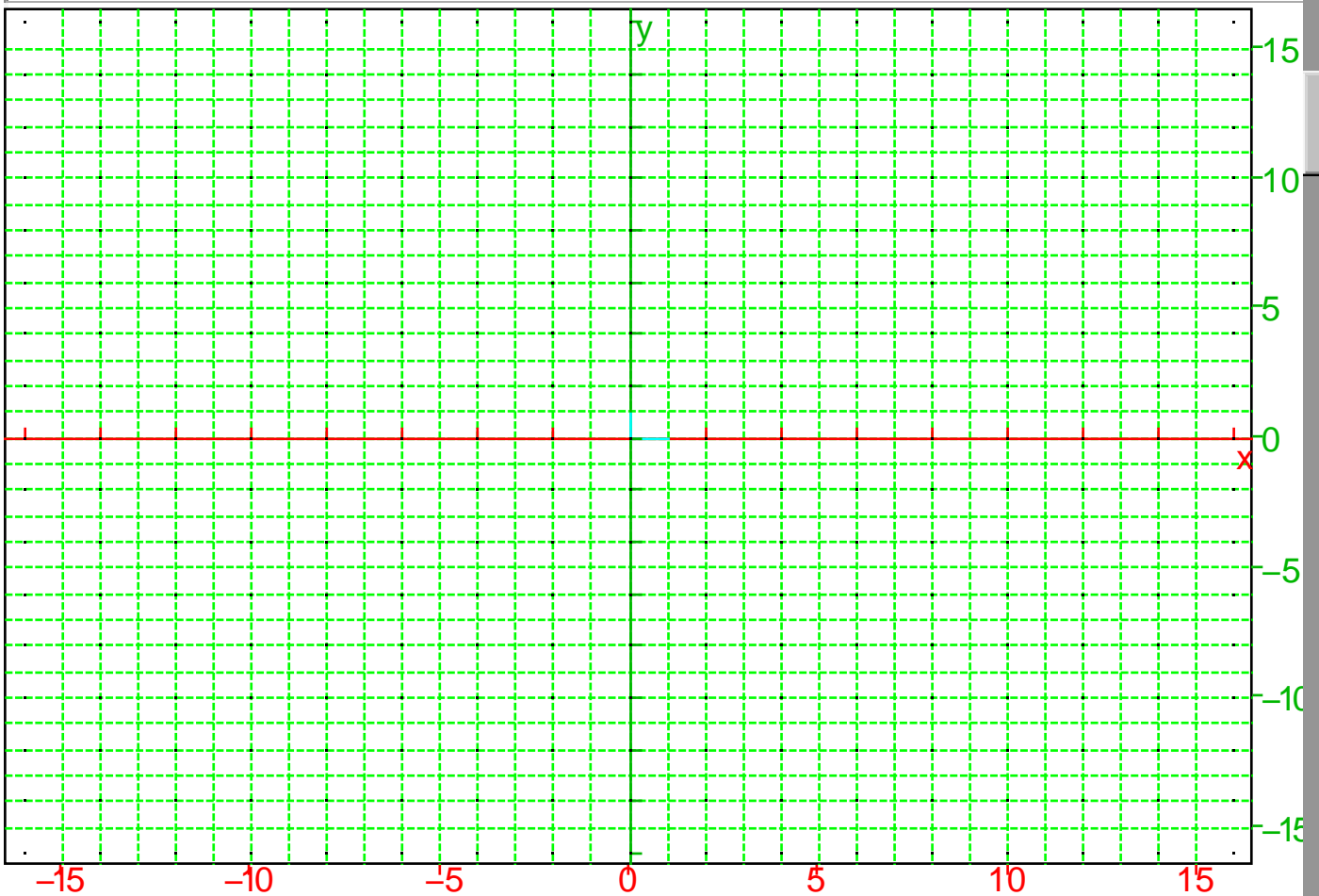
10



```
84 l1:= [ seq (droite (x=k, display=vert+ligne_tiret), k=-15..15) ];
```



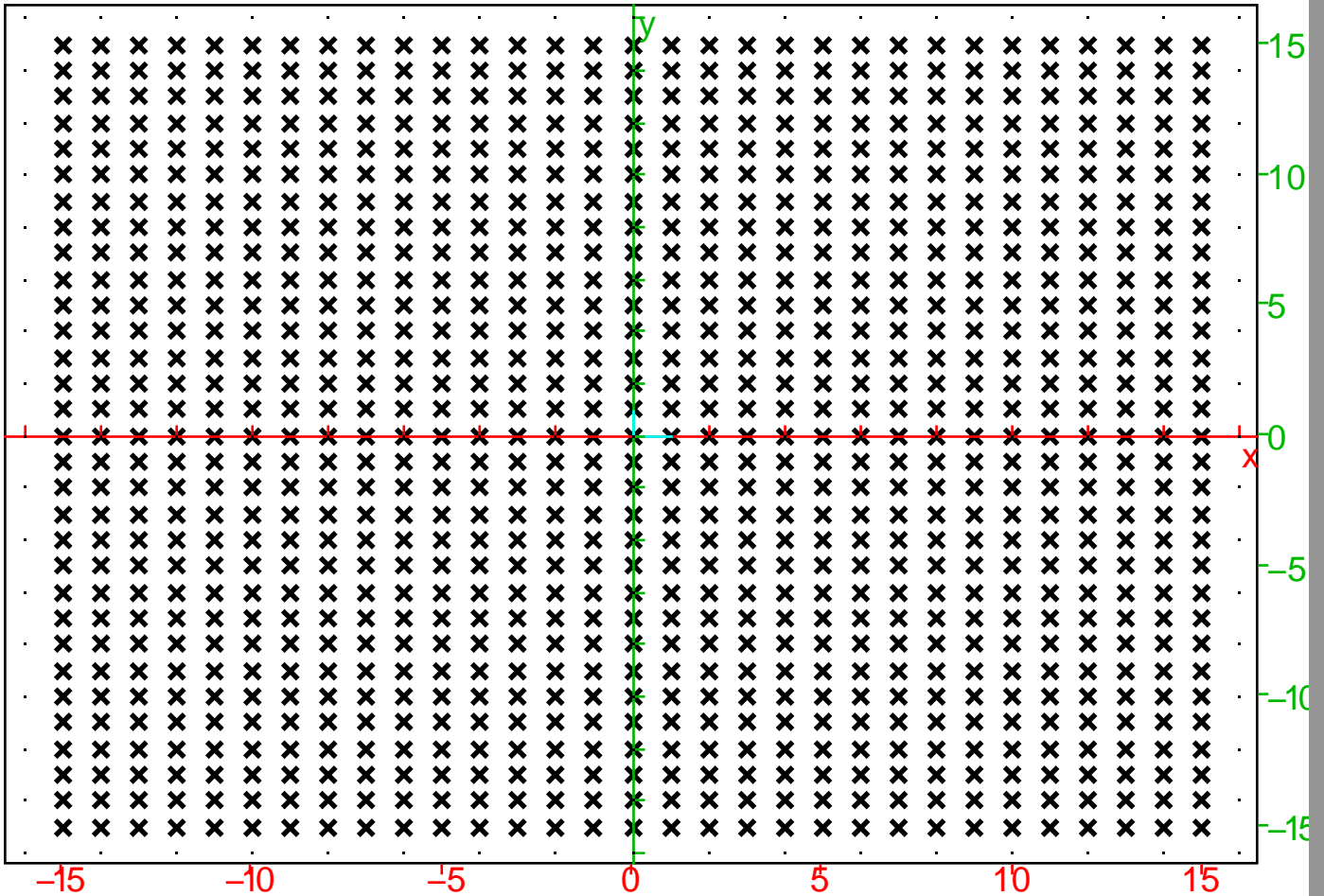
```
85 ZI:=[l1,l1*i];
```



```
86 Pour ne pas afficher les nom. le plus simple est d'aller dans le menu cfa \a droite.
```

87

```
Gentiers:=inter(11,i*11,display=epaisseur_point_2+hidden_name);
```



88

89 Fig Edit Graphe Repère Mode    Lands  pe

1 ZI;

Done

2 p:=point(1+2\*i,affichage=bleu+epaisseur\_point\_3);

point(1,2)

3 a:=affiche(p);

1+2\*i

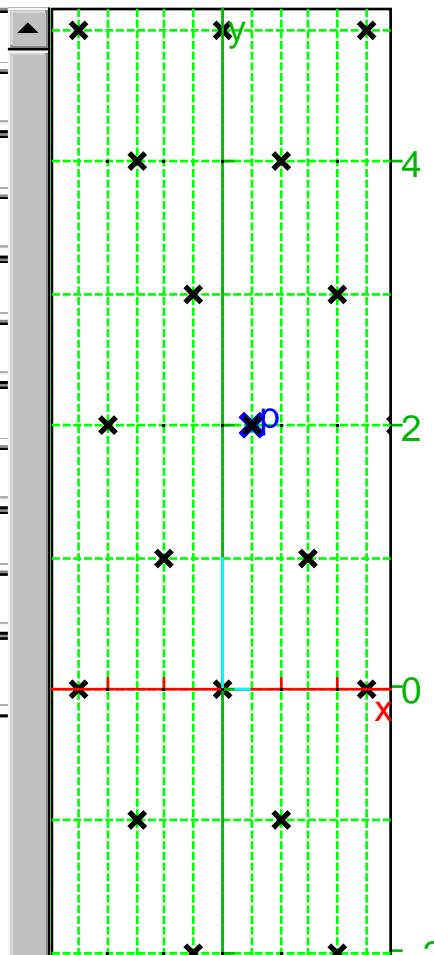
4 Gentiers\*a;

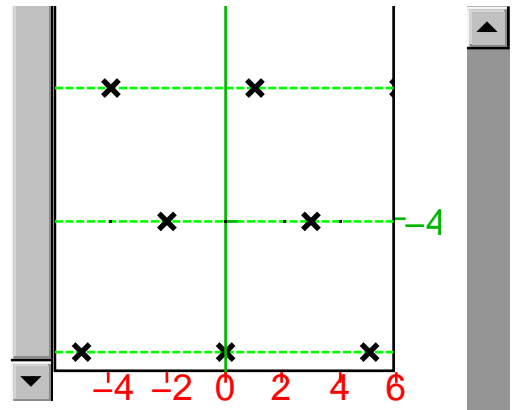
Done

5 cercle(10+7\*i,abs(a));

cercle(point(10,7),sqrt(5))

6





```
90 color (ZI, rouge) ;
```



```
91 ----- EXERCICE -----
```

```
92 purge (a) ;
```

$$1+2*i$$

```
93 trigexpand (cos (5*a)) ;
```

$$16 * \cos(a)^5 - 20 * \cos(a)^3 + 5 * \cos(a)$$

```
94 normal (int (cos (5*x) / (2+sin (x)), x=0..Pi/2)) ; //simplify ne marche pas?
```

$$200 * \ln(2) + 200 * \ln(2) \quad \frac{254}{255}$$

95 `P:=int(cos(5*x)/(2+sin(x)),x);`

$$2 * \left( \frac{209 * \ln(\sin(x) + 2)}{3} + \frac{32 * \sin(x)^4 - \frac{256 * \sin(x)^3}{3} + 208 * \sin(x)^2 - 832 * \sin(x)}{3} \right)$$

96 La forme developpee avant l'integration est plus simple:

97 `P:=int(trigexpand(cos(5*x)/(2+sin(x))),x);`

$$5 * \ln(\sin(x) + 2) - 20 * \left( \frac{\sin(x)^2}{3} - 3 * \ln(\sin(x) + 2) + 2 * \sin(x) \right) + 16 * \left( \frac{\sin(x)^4}{3} - \frac{2 * \sin(x)^3}{3} \right)$$

98 `simplify(diff(P,x)-cos(5*x)/(2+sin(x))); //NB: normal ne suffit pas.`

0

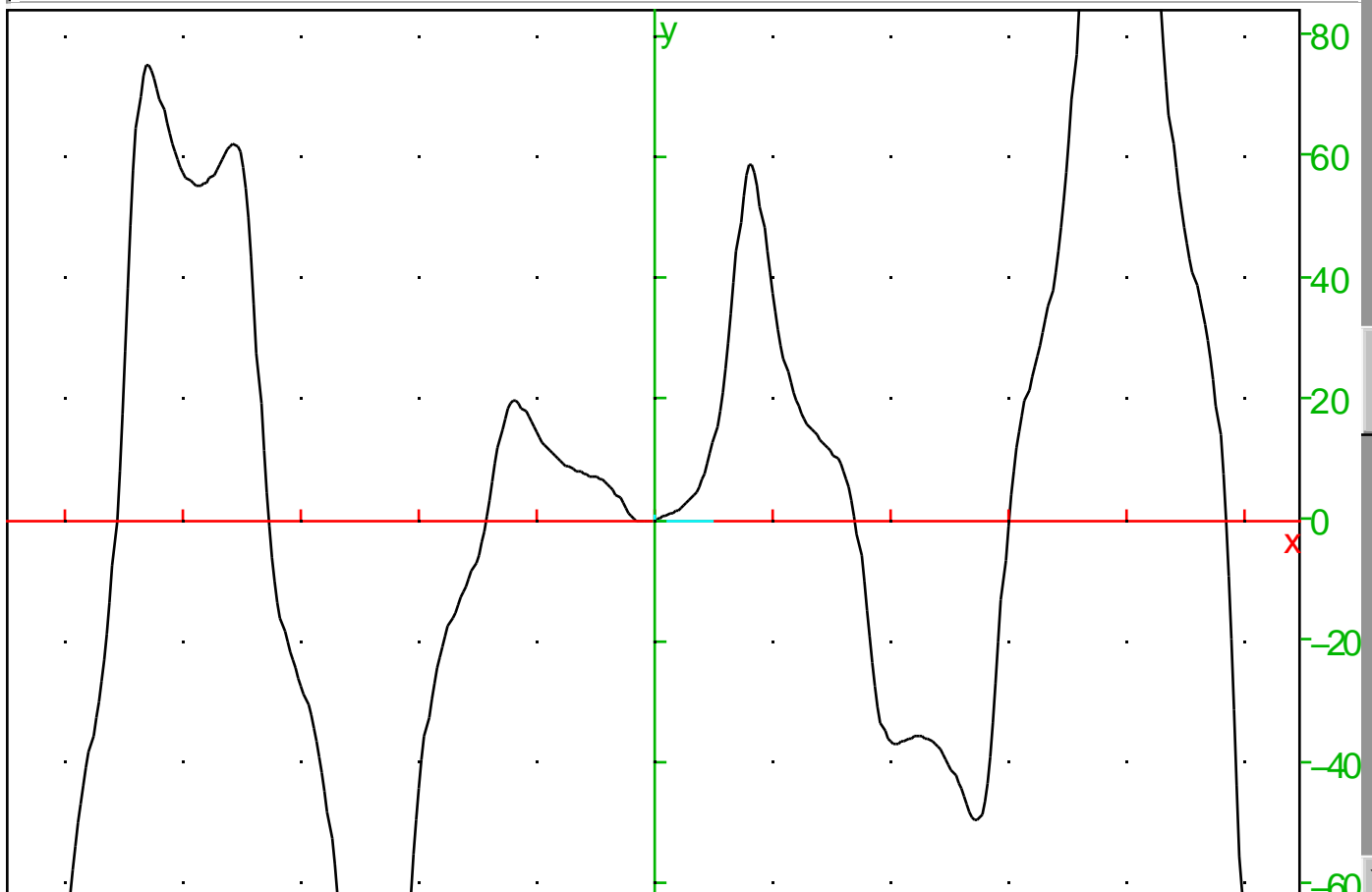
99 **EXERCICE**

100 La decomposition en elements simples introduit une extension de corps. (Que le logiciel ne pourra pas toujours trouver)

101 `I1:=int(cos(5*x)/(2+sin(3*x)));`

$$-2 * \sin(x)^2 + -2 * x + \int \frac{(\tan(\frac{x}{2}) + 1) * (160 * \tan(\frac{x}{2})^4 + 896 * \tan(\frac{x}{2})^3 + 448 * \tan(\frac{x}{2})^2 + 128 * \tan(\frac{x}{2}) + 64)}{32 * (\tan(\frac{x}{2})^6 + 3 * \tan(\frac{x}{2})^5 + 3 * \tan(\frac{x}{2})^4 - 10 * \tan(\frac{x}{2})^3 + 10 * \tan(\frac{x}{2})^2 - 6 * \tan(\frac{x}{2}) + 1)} dx$$

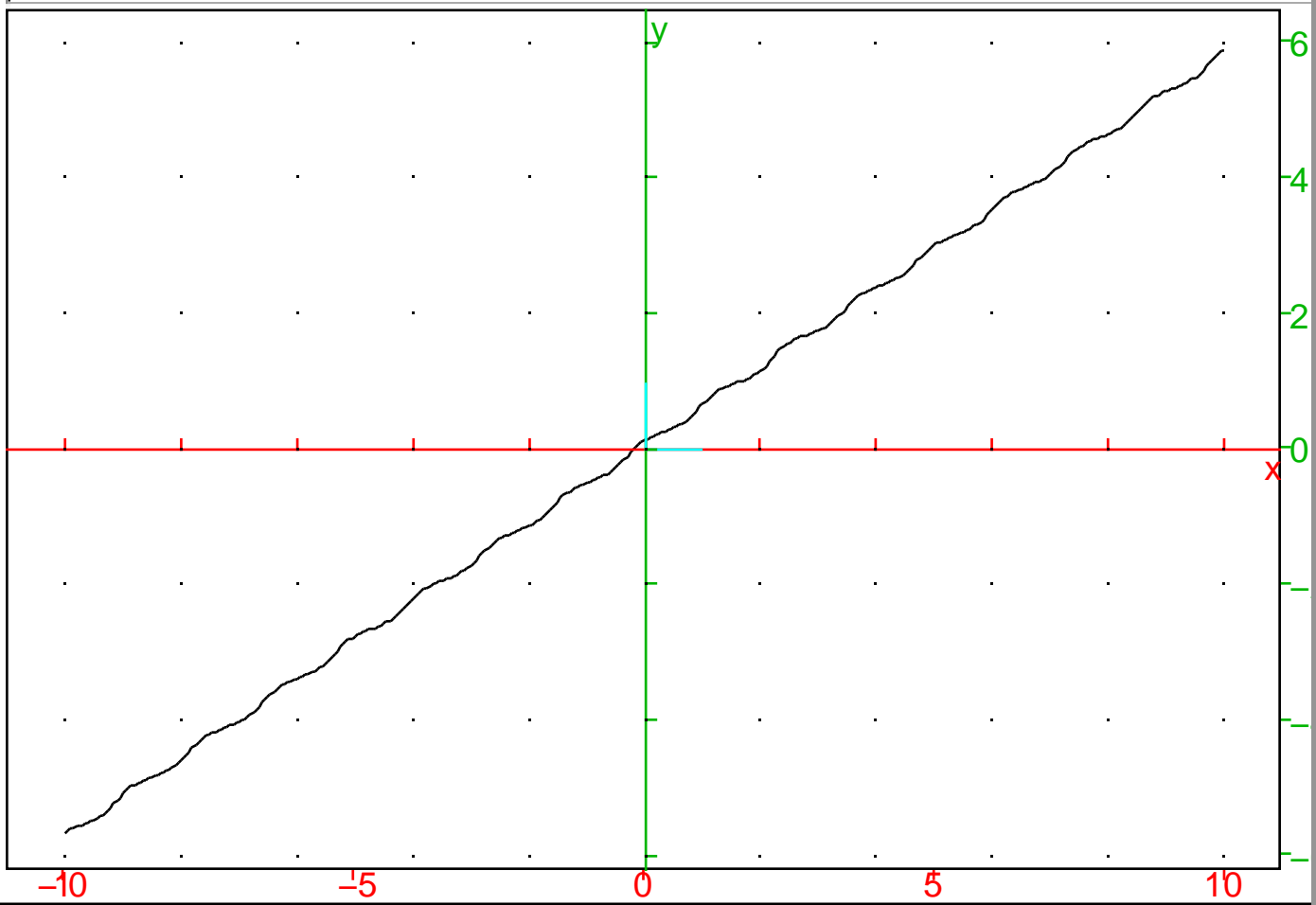
102 `plot(I1);`



103 `I2:=int(1/(2+sin(5*x))) // Attention a la partie entiere given as floor`

$$2 * \frac{1}{\sqrt{3}} * \frac{1}{5} * (\operatorname{atan}\left(\frac{2 * \tan\left(\frac{5 * x}{2}\right) + 1}{\sqrt{3}}\right) + \pi * \operatorname{floor}\left(\frac{1}{2} + \frac{5 * x}{2 * \pi}\right))$$

104 `plot(I2);`



105 `P1:=(x^2-1)/(x-1);`

$$\frac{x^2 - 1}{x - 1}$$

106 `expand(P1); //developpe dans Q(x)`

$$\frac{x^2}{x-1} - \frac{1}{x-1}$$

107 `normal(P1), simplify(P1); //les 2 simplifient`

$$(x + 1, x + 1)$$

108 `P2:=-cos(5*x)+16*cos(x)*sin(x)^4-12*cos(x)*sin(x)^2+cos(x);`

$$\cos(x) - \cos(5 * x) - 12 * \cos(x) * \sin(x)^2 + 16 * \cos(x) * \sin(x)^4$$

109 `expand(P2);`

$$2 \quad 4$$



110 `normal (P2);`

$$-\cos(5*x)+16*\cos(x)*\sin(x)^4-12*\cos(x)*\sin(x)^2+\cos(x)$$

111 `simplify (P2);`

$$0$$

112 `factor (X^12-1);`

$$(X-1)*(X+1)*(X^2+1)*(X^2-X+1)*(X^2+X+1)*(X^4-X^2+1)$$

113 phi12 est le facteur qui n'apparait pas dans:

114 `factor (X^6-1); factor (X^4-1);`

$$((X-1)*(X+1)*(X^2-X+1)*(X^2+X+1), (X-1)*(X+1)*(X^2+1))$$

115 `P:=(2*x+1)^2*(x^5-1)/(x-1);`

$$\frac{(x^5-1)*(2*x+1)^2}{x-1}$$

116 `complex_mode :=1; factor (P*1.1); factor (approx (P));`

$$4.4*(x+0.8090169944+0.5877852523*i)*(x+0.8090169944-0.5877852523*i)*(x+0.3090169944+0.9510565163*i)*(x+0.3090169944-0.9510565163*i)*(x+0.5+7.227651959e-08*i)*(x+0.5-7.227651959e-08*i)$$

117 `complex_mode :=0; factor (P*1.0); factor (approx (P,5)); factor (P);`

$$(x-1)*(x+1)*(x^2+1)*(x^2-x+1)*(x^2+x+1)$$

118 On peut factoriser en imposant une extension algebrique avec une syntaxe comme dans maple. Mais je ne le trouve pas dans la doc (c'est rare). Exemples:

119 `factor (X^12-1, sqrt (3));`

$$(X-1)*(X+1)*(X^2+1)*(X^2-X+1)*(X^2+X+1)*(X^2+1)$$

120 `factor (X^12-1, [sqrt (3), i]);`

$$(X-1)*(X+1)*(X+i)*(X-i)*(X^2-X+1)*(X^2+X+1)*(X^2+i*X-1)*(X^2+(-i)*X-1)$$

121 `factor (X^12-1, exp (2*i*Pi/9));`

$$(X-1)*(X+1)*(X^2+1)*(X^2-X+1)*(X^2+X+1)*(X^4-X^2+1)*\exp\left(\frac{2*i*\pi}{9}\right)$$

122 selon les versions, cFactor(...,a) est plus sur si l'on veut etre sur que i a ete utilise. (

123 `cFactor (X^12-1, sqrt (3)); //est probablement plus sur`

$$(X-1)*(X+1)*(X^2+1)*(X^2-X+1)*(X^2+X+1)*(X^2+1)$$

124 EXERCICE

125 `purge(a,u,v);`

( No such variable a, n -> simplify(f@@n(0)), No such variable v )

126 `b:=a+u;c:=b+v; //on ordonne a,b,c`

( a+u, a+u+v )

127 `F:=a/(b+c)+b/(a+c)+c/(a+b)-3/2;`

$$-\frac{3}{2} + \frac{a}{a+u+a+u+v} + \frac{a+u}{a+u+v+a} + \frac{a+u+v}{a+u+a}$$

128 le numerateur et le denominateur n'ont que des coefficients positifs, donc F>0 pour 0<a, 0<u, 0<v

129 `numer(F);`

$$2*u^3 + 2*v^3 + 4*a*u^2 + 4*a*v^2 + 5*u*v^2 + 3*u^2*v + 4*a*u*v$$

130 `denom(F);`

3 3 2 2 2 2 2 2

131 EXERCICE

132 Prog Edit Ajoute 1 | nxt Fonctior Test Boucle OK Save

```
quodicho(a,b):={
  local n,aa,bb,g;
  n:=0;aa:=1;bb:=1;
  while((b*2^n) <= a){
    n:=n+1;
  }
  aa:=2^(n-1);bb:=2^n;
  for(k:=1;k<n;k++){
    g:=iquo(aa+bb,2);
    if(g*b<=a){ aa:=g; }
```

Interprète quodicho

Attention: k, déclarée(s) comme variable(s) globale(s) lors de la compilation quodicho

Done

133 `quodicho(127,33)==iquo(127,33); // doit etre vrai`

vrai

134

135 EXERCICE

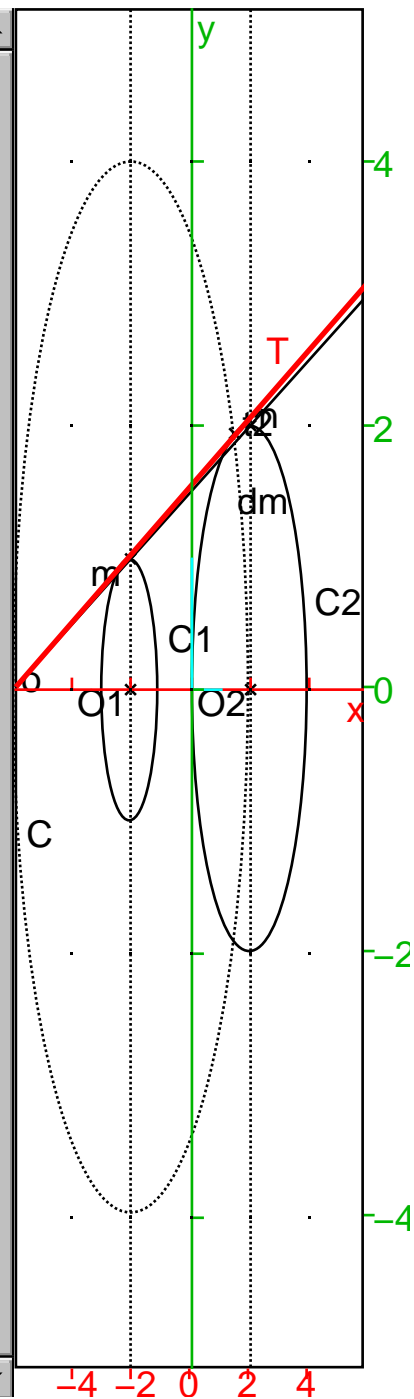
136 Strategie: On cherche le centre o d'une homothetie transformant C1 en C2, en suite on recupere le point de contact en exprimant qu'il est le sommet d'un triangle rectable de base [oO2]. Attention, inter rend un objet de type groupe de points, meme s'il y a unicite, pour choisir un point dans l'intersection on utilise inter\_unique

137 Fig Edit Graphe Repère Mode  St  Lands  pe

```

1 O1:=point(-2);O2:=point(2);r1:=1;
  pnt(pnt[-2,536870968,"O1"],pnt(pnt[2,536870968,"O2"]))
2 r2:=element(1.2..5,2);//Attention a ne pas faire de ce
  parameter([r2,1.2,5,2,0.038])
3 C1:=cercle(O1,r1);
  cercle(point(-2,0),1)
4 C2:=cercle(O2,r2);
  cercle(point(2,0),2)
5 m:=point(O1+i);droite(O1,m,affichage=dot_line);//ur
  [point(-2,1),droite(x=-2)]
6 dm:=parallele(O2,droite(O1,m),affichage=dot_line);
  droite(x=2)
7 n:=inter_unique(dm,C2);
  point(2,2)
8 droite(m,n);o:=inter_unique(droite(m,n),droite(O1,C
  [droite(y=(x/4+3/2)),point(-6,0)]
9 C:=cercle(O2,o,affichage=dot_line);t2:=inter_unique
  [cercle(point(-2,0),4),point(((i)*sqrt(15)+3)/2)]
10 T:=droite(o,t2,affichage=(rouge+line_width_2));
  droite(y=((sqrt(15)*x)/15+(2*sqrt(15))/5))
11

```



138