Příkaz **restart** zapomene všechno, co jsme provedli od startu programu Maple

```
> restart;
>
```

Seznam

je uspořádaný a jeho prvky se mohou opakovat

```
> [1,2,2,1];
```

$$[1, 2, 2, 1]$$

Počet prvků seznamu nám vrátí funkce **nops**

```
> nops(%);
  nops([]);
```

$$4$$

$$0$$

Právě na seznamech spočívá schopnost programů pro symbolické manipulace reprezentovat !

```
> Y:=whattype(a+b*c+d);
  X:=convert(a+b*c+d,list);
  nops(X);
  Y(op(X));
```

$$Y := +$$

$$X := [a, b\, c, d]$$

$$3$$

$$a + b\, c + d$$

Protože víme že jde o součet, poslední řádek jsme také mohli zapsat jako

```
> `+`(op(X));
```

$$a + b\, c + d$$

Vnořené seznamy jsou také možné

```
> [1,[2,[3,[4,5]]]];
```

$$[1, [2, [3, [4, 5]]]]$$

Tak lze nahradit chybějící typ struktura/záznam

```
> ["Markéta Lazarová",162,1967,["Vláčil, František", 1924, 1999]];
```

["Marketa Lazarova", 98, 1966, ["Vlacil, Frantisek", 1929, 1999]]

Množina

```
> Y:={1,2,2,1};
```

$$Y := \{1, 2\}$$

Opakující se prky se vyřadí.

```
> {1,2,3} union {2,3,4};
  {1,2,3} intersect {2,3,4};
  {1,2,3} minus {2,3,4};
```

$$\{1, 2, 3, 4\}$$

$$\{2, 3\}$$

$$\{1\}$$

Indexace [ ]

```
> X[2];
```

$$p\,q$$

```
> Y[2];
```

$$2$$

op

```
> op(X);
```

$$a, b\,c, d$$

```
> op(Y);
```

$$1, 2$$

```
> convert(X,set) = {op(X)};
  convert(Y,list) = [op(Y)];
```

$$\{a, d, b\,c\} = \{a, d, b\,c\}$$
$$[1, 2] = [1, 2]$$

Práce se seznamy

```
> X;
```

$$[a, b\,c, d]$$

```
> X[2]:=p*q;
```

$$X_2 := p\,q$$

```
> X;
```

$$[a, p\,q, d]$$

```
> X[1..2]; # ubrání posledního
```

$$[a, p\,q]$$

```
> [op(X),m*n]; # přidání na konec
```

$$[a, p\,q, d, m\,n]$$

```
> [-1, op(X)]; # přidání na začátek list
```

$$[-1, a, p\,q, d]$$

```
> subsop(4=0,8=0,[seq(i,i=0..10)]);
```

$$[0, 1, 2, 0, 4, 5, 6, 0, 8, 9, 10]$$

```
>
>
```

Funkce " -> "

Uvidíme časem, že jde o užitečnou zkratku

(Pokud má funkce provádět sekvenci příkazů, musíme ji deklarovat jinak, viz příště)

```
> F:=x->x^2;
```

$$F := x \to x^2$$

```
> F(1);
  F(t);
```

$$1$$
$$t^2$$

Můžeme deklarovat funkci více proměnných, pokud jejich seznam dáme do závorek, navíc máme k dispozici **if** s významem podobnvm ? v C.

Složitější fukce budeme již explicině psát jako G:=proc (....) .... end;

```
> G:=(x,y) -> x*y;
```

$$G := (x, y) \rightarrow x\, y$$

```
> G:=(x,y) -> if (x>0) then y else -y fi;
```

$$G := \mathbf{proc}(x, y)\ \mathbf{option}\ operator, arrow;\ \mathbf{if}\ 0 < x\ \mathbf{then}\ y\ \mathbf{else}\ -y\ \mathbf{fi\ end}$$

```
> G(0,b);
```

$$-b$$

```
>
```

map

Zobrazení seznamu či množiny

```
> map(u->1/(u^2+1),[a,b,c]);
```

$$\left[\frac{1}{a^2+1}, \frac{1}{b^2+1}, \frac{1}{c^2+1}\right]$$

Následuje ukázka ppoužití výše uvedených operací

```
> X:=1/2*ln((-2*a+sqrt(rho^2+(z+a)^2)+sqrt(rho^2+(z-a)^2))/(2*a+sq
  rt(rho^2+(z+a)^2)+sqrt(rho^2+(z-a)^2)));
```

$$X := \frac{1}{2} \ln\left(\frac{-2\,a + \sqrt{\rho^2 + z^2 + 2\,z\,a + a^2} + \sqrt{\rho^2 + z^2 - 2\,z\,a + a^2}}{2\,a + \sqrt{\rho^2 + z^2 + 2\,z\,a + a^2} + \sqrt{\rho^2 + z^2 - 2\,z\,a + a^2}}\right)$$

```
> series(X,a):
  Y:=(convert(%,polynom)):
  whattype(Y);
  Y:=convert((Y),list):
  map(factor,Y);
```

$$+$$

$$\left[-\frac{a}{\sqrt{\rho^2+z^2}}, \frac{1}{6}\frac{(\rho^2 - 2\,z^2)\,a^3}{(\rho^2+z^2)^{(5/2)}}, 0, -\frac{1}{40}\frac{(3\,\rho^4 - 24\,\rho^2\,z^2 + 8\,z^4)\,a^5}{(\rho^2+z^2)^{(9/2)}}\right]$$

```
>
```

Tabulky

Pokud nějaký symbol není ani pole ani množina, vznikne přiřazením do jeho složky **tabulka,** kde se pamatuje, které hodnoty jsou obsazené a jakou hodnotou

```
> T[-1]:=Nic;
```

$$T_{-1} := Nic$$

```
> T;
```

$$T$$

```
> T[0];
```

$$T_0$$

```
> T[-1];
```

$$Nic$$

Index nemusí být vůbec číslo

```
> T[Praha]:=27.3;
```

$$T_{Praha} := 27.3$$

Co je **T** zač zjistíme výpisem **op(T)**

```
> op(T);
```

table([

$Praha = 27.3$

$-1 = Nic$

])

```
>
>
```

Rovnice a nerovnice rhs,lhs,evalb

```
> a=b;
```

$$a = b$$

```
> a>b;
```

$$b < a$$

```
> evalb(%);
```

$$b - a < 0$$

```
> subs(a=3,b=4,%);
```

$$1 < 0$$

```
> evalb(%);
```

$$false$$

```
> rhs(a>b);
```

$$a$$

```
> lhs(a>b);
```

$$b$$

```
>
```

seq

```
> seq(i,i=1..10);
```

$$1, 2, 3, 4, 5, 6, 7, 8, 9, 10$$

```
> seq(Int(sin(x)^i,x) = combine(int(sin(x)^i,x)),i=1..4);
```

$$\int \sin(x)\, dx = -\cos(x),\ \int \sin(x)^2\, dx = -\frac{1}{4}\sin(2\,x) + \frac{1}{2}x,$$

$$\int \sin(x)^3\, dx = -\frac{3}{4}\cos(x) + \frac{1}{12}\cos(3\,x),\ \int \sin(x)^4\, dx = \frac{1}{32}\sin(4\,x) - \frac{1}{4}\sin(2\,x) + \frac{3}{8}x$$

```
> rhs(%[3]);
```

$$-\frac{3}{4}\cos(x) + \frac{1}{12}\cos(3\,x)$$

```
>
```

$

```
> [1$10];
```

$$[1, 1, 1, 1, 1, 1, 1, 1, 1, 1]$$

```
>
```

```
> simplify(exp(x^2)*diff(exp(-x^2),x   $   10));
```

$$-30240 + 302400\,x^2 - 403200\,x^4 + 161280\,x^6 - 23040\,x^8 + 1024\,x^{10}$$

```
> i$i=1..3;
```

$$1, 2, 3$$

```
> $4..8,$104..108;
```

$$4, 5, 6, 7, 8, 104, 105, 106, 107, 108$$

Pole

představují to, co jsme si zvykli nazývat polem třeba v Pascalu

```
> array(1..4);
```

$$[\,?_1, ?_2, ?_3, ?_4\,]$$

```
> X:=array(1..4); # ejhle rozdíl !
```

$$X := \text{array}(\,1\,..\,4, [\ \ ]\,)$$

```
> X[1]:=1;
  X[2]:=2;
  X[3]:=4;
  X[4]:=8;
```

$$X_1 := 1$$

$$X_2 := 2$$

$$X_3 := 4$$

$$X_4 := 8$$

Mohli jsme si ale ušetřit trochu psaní a hodnoty pole zadat v rámci deklarace

```
> W:=array(1..4,[1,2,4,8]);
```

$$\mathrm{W} := [\,1, 2, 4, 8\,]$$

Následující dva řádky ukáží,

```
> X;
  W;
```

$$X$$

$$\mathrm{W}$$

```
> eval(X);
  eval(W);
```

$$[\,1, 2, 4, 8\,]$$

$$[\,1, 2, 4, 8\,]$$

```
> X[5]:=1;
Error, 1st index, 5, larger than upper array bound 4
> Y[5]:=1;
```

$$Y_5 := 1$$

```
> Y;
```

$$Y$$

```
> eval(Y);
```

table([
    5 = 1

])

```
>
```

Matice

```
> A:=array(1..3,1..3,[[0,0,1],[0,1,0],[1,0,0]]);
  X:=array(1..3,[1,2,3]);
```

$$A := \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

$$X := [1, 2, 3]$$

```
> A&*X;
```

$$A \mathbin{\&*} X$$

```
> evalm(A&*X);
```

$$[3, 2, 1]$$

```
> det(A);
```

$$\det(A)$$

Jaktože neumí determinant ?

```
> with(linalg);
> det(A);
```

$$-1$$

```
> A:=matrix(8,8,(a,b)->1/(a+b-1));
```

$$A := \begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} & \frac{1}{10} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} & \frac{1}{10} & \frac{1}{11} \\ \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} & \frac{1}{10} & \frac{1}{11} & \frac{1}{12} \\ \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} & \frac{1}{10} & \frac{1}{11} & \frac{1}{12} & \frac{1}{13} \\ \frac{1}{7} & \frac{1}{8} & \frac{1}{9} & \frac{1}{10} & \frac{1}{11} & \frac{1}{12} & \frac{1}{13} & \frac{1}{14} \\ \frac{1}{8} & \frac{1}{9} & \frac{1}{10} & \frac{1}{11} & \frac{1}{12} & \frac{1}{13} & \frac{1}{14} & \frac{1}{15} \end{bmatrix}$$

```
> det(A);
```

$$\frac{1}{365356847125734485878112256000000}$$

Cykly

Když máme pole, potřebujeme cykly. Syntaxe je ale bohužel katastrofální:

```
> for i from 1 to 4 do
    X[i]:=2^(i-1);
  od;
```

$$X_1 := 1$$

$$X_2 := 2$$

$$X_3 := 4$$

$$X_4 := 8$$

```
> for i in [1,2,3,4] do
    print( i );
  od;
```

1
2
3
4

```
> for  i in [$4..8,$104..108] do
   print (i);
  od;
```

4
5
6
7
8
104
105
106
107
108

Středníky a dvojtečky v cyklech:

```
> for i from 1 to 4 do
    X[i]:=2^(i-1);
  od:
```

```
> for i from 1 to 4 do
    X[i]:=2^(i-1):
  od;
```

$$X_1 := 1$$

$$X_2 := 2$$

$$X_3 := 4$$

$$X_4 := 8$$

```
> for i from 1 while i^2<100 do
   print(i);
  od;
```

$$1$$
$$2$$
$$3$$
$$4$$
$$5$$
$$6$$
$$7$$
$$8$$
$$9$$

```
> while i<200 do
   i := i*2;
  od;
```

$$i := 20$$
$$i := 40$$
$$i := 80$$
$$i := 160$$
$$i := 320$$

```
>
```

Spojování jmen

```
> X.1;
```

$$X1$$

```
> cat(X,1);
```

$$X1$$

```
> F:=4;
```

$$F := 4$$

```
> F.1;
```

$$F1$$

```
> cat(F,1);
```

$$41$$

```
> sum(a.i*x^i,i=0..4);
Error, (in sum) summation variable previously assigned, second argument evaluates to, 5 = 0 .. 4
```

Chyba!! proměnná i má přiřazenou hodnotu, takže ...

```
> sum(a.i*x^i,'i'=0..4);
```

$$5\, a5\, x^5$$

To taky není co bychom chtěli

```
> sum('a.i*x^i','i'=0..4);
```

$$a0 + a1\, x + a2\, x^2 + a3\, x^3 + a4\, x^4$$

Tento postup je důležitý když chceme zkonstruovat polynom vyššího řádu

```
> N:=8;
```

$$N := 8$$

```
> F:=sum('a.i*x^i','i'=0..N);
```

$$F := a0 + a1\,x + a2\,x^2 + a3\,x^3 + a4\,x^4 + a5\,x^5 + a6\,x^6 + a7\,x^7 + a8\,x^8$$

```
> ERR:=int( (F-sin(x))^2,x=0..2*Pi);
```

$$ERR := -20160\,a7\,\pi + \frac{8192}{13}\,a6^2\,\pi^{13} + 13440\,a7\,\pi^3 - 2688\,a7\,\pi^5 + \frac{1024}{5}\,a1\,a8\,\pi^{10} + 64\,a1\,a6\,\pi^8 + \frac{64}{3}\,a0\,a5\,\pi^6 + \frac{16384}{13}\,a5\,a7\,\pi^{13} + \frac{4096}{11}\,a2\,a8\,\pi^{11} + 64\,a2\,a5\,\pi^8 + \frac{32768}{15}\,a7^2\,\pi^{15} + \frac{2048}{11}\,a5^2\,\pi^{11} + \frac{131072}{17}\,a8^2\,\pi^{17} + 4\,a1\,\pi + 8\,a1\,a2\,\pi^4 + \frac{64}{5}\,a0\,a4\,\pi^5 + 8\,a0\,a3\,\pi^4 + \frac{128}{7}\,a3^2\,\pi^7 + \frac{512}{9}\,a4^2\,\pi^9 + \frac{8}{3}\,a1^2\,\pi^3 + \frac{32}{5}\,a2^2\,\pi^5 + 2\,a0^2\,\pi + 16\,a3\,\pi^3 - 24\,a3\,\pi + 8\,a2\,\pi^2 + 32\,a4\,\pi^4 - 96\,a4\,\pi^2 + \frac{16}{3}\,a0\,a2\,\pi^3 + 4\,a0\,a1\,\pi^2 + 64\,a3\,a4\,\pi^8 + \frac{256}{7}\,a2\,a4\,\pi^7 + \frac{64}{3}\,a2\,a3\,\pi^6 + \frac{64}{3}\,a1\,a4\,\pi^6 + \frac{64}{5}\,a1\,a3\,\pi^5 + \frac{16384}{7}\,a6\,a7\,\pi^{14} + \frac{1024}{5}\,a2\,a7\,\pi^{10} + 64\,a0\,a7\,\pi^8 + \frac{1024}{9}\,a3\,a5\,\pi^9 + \frac{1024}{5}\,a3\,a6\,\pi^{10} + \frac{65536}{15}\,a6\,a8\,\pi^{15} + \frac{1024}{9}\,a2\,a6\,\pi^9 + \frac{1024}{9}\,a1\,a7\,\pi^9 + \frac{256}{7}\,a1\,a5\,\pi^7 + \frac{2048}{3}\,a4\,a7\,\pi^{12} + \frac{4096}{11}\,a4\,a6\,\pi^{11} + \frac{16384}{13}\,a4\,a8\,\pi^{13} + \frac{1024}{9}\,a0\,a8\,\pi^9 + \frac{256}{7}\,a0\,a6\,\pi^7 + \frac{2048}{3}\,a5\,a6\,\pi^{12} + \frac{4096}{11}\,a3\,a7\,\pi^{11} + \frac{1024}{5}\,a4\,a5\,\pi^{10} + \frac{2048}{3}\,a3\,a8\,\pi^{12} + \frac{16384}{7}\,a5\,a8\,\pi^{14} + 8192\,a7\,a8\,\pi^{16} - 960\,a6\,\pi^4 + 512\,a8\,\pi^8 - 161280\,a8\,\pi^2 + 53760\,a8\,\pi^4 - 7168\,a8\,\pi^6 + 64\,a5\,\pi^5 - 320\,a5\,\pi^3 + 480\,a5\,\pi + 256\,a7\,\pi^7 + \pi + 128\,a6\,\pi^6 + 2880\,a6\,\pi^2$$

funkce **seq** mi neschválí ani **'i'** , takže musím

```
> i:='i';
```

$$i := i$$

```
> Nezn:={seq(a.i,i=0..N)};
```

$$Nezn := \{a6, a8, a5, a7, a0, a4, a1, a2, a3\}$$

```
> Rov:={seq(diff(ERR,a.i),i=0..N)};
>
```

$$Rov := \{\frac{16384}{13}\,a6\,\pi^{13} + 64\,a1\,\pi^8 + \frac{16384}{7}\,a7\,\pi^{14} + \frac{1024}{5}\,a3\,\pi^{10} + \frac{65536}{15}\,a8\,\pi^{15} + \frac{1024}{9}\,a2\,\pi^9 + \frac{4096}{11}\,a4\,\pi^{11} + \frac{256}{7}\,a0\,\pi^7 + \frac{2048}{3}\,a5\,\pi^{12} - 960\,\pi^4 + 128\,\pi^6 + 2880\,\pi^2, -20160\,\pi + 13440\,\pi^3 - 2688\,\pi^5 + \frac{16384}{13}\,a5\,\pi^{13} + \frac{65536}{15}\,a7\,\pi^{15} + \frac{16384}{7}\,a6\,\pi^{14} + \frac{1024}{5}\,a2\,\pi^{10} + 64\,a0\,\pi^8 + \frac{1024}{9}\,a1\,\pi^9 + \frac{2048}{3}\,a4\,\pi^{12} + \frac{4096}{11}\,a3\,\pi^{11} + 8192\,a8\,\pi^{16} + 256\,\pi^7, \frac{1024}{5}\,a1\,\pi^{10} + \frac{4096}{11}\,a2\,\pi^{11} + \frac{262144}{17}\,a8\,\pi^{17} + \frac{65536}{15}\,a6\,\pi^{15} + \frac{16384}{13}\,a4\,\pi^{13} + \frac{1024}{9}\,a0\,\pi^9 + \frac{2048}{3}\,a3\,\pi^{12} + \frac{16384}{7}\,a5\,\pi^{14}$$

$$+ 8192\, a7\, \pi^{16} + 512\, \pi^{8} - 161280\, \pi^{2} + 53760\, \pi^{4} - 7168\, \pi^{6}, \frac{64}{3}\, a5\, \pi^{6} + \frac{64}{5}\, a4\, \pi^{5} + 8\, a3\, \pi^{4}$$

$$+ 4\, a0\, \pi + \frac{16}{3}\, a2\, \pi^{3} + 4\, a1\, \pi^{2} + 64\, a7\, \pi^{8} + \frac{1024}{9}\, a8\, \pi^{9} + \frac{256}{7}\, a6\, \pi^{7}, \frac{1024}{5}\, a8\, \pi^{10} + 64\, a6\, \pi^{8}$$

$$+ 4\, \pi + 8\, a2\, \pi^{4} + \frac{16}{3}\, a1\, \pi^{3} + 4\, a0\, \pi^{2} + \frac{64}{3}\, a4\, \pi^{6} + \frac{64}{5}\, a3\, \pi^{5} + \frac{1024}{9}\, a7\, \pi^{9} + \frac{256}{7}\, a5\, \pi^{7},$$

$$\frac{4096}{11}\, a8\, \pi^{11} + 64\, a5\, \pi^{8} + 8\, a1\, \pi^{4} + \frac{64}{5}\, a2\, \pi^{5} + 8\, \pi^{2} + \frac{16}{3}\, a0\, \pi^{3} + \frac{256}{7}\, a4\, \pi^{7} + \frac{64}{3}\, a3\, \pi^{6}$$

$$+ \frac{1024}{5}\, a7\, \pi^{10} + \frac{1024}{9}\, a6\, \pi^{9}, 8\, a0\, \pi^{4} + \frac{256}{7}\, a3\, \pi^{7} + 16\, \pi^{3} - 24\, \pi + 64\, a4\, \pi^{8} + \frac{64}{3}\, a2\, \pi^{6}$$

$$+ \frac{64}{5}\, a1\, \pi^{5} + \frac{1024}{9}\, a5\, \pi^{9} + \frac{1024}{5}\, a6\, \pi^{10} + \frac{4096}{11}\, a7\, \pi^{11} + \frac{2048}{3}\, a8\, \pi^{12}, \frac{64}{5}\, a0\, \pi^{5} + \frac{1024}{9}\, a4\, \pi^{9}$$

$$+ 32\, \pi^{4} - 96\, \pi^{2} + 64\, a3\, \pi^{8} + \frac{256}{7}\, a2\, \pi^{7} + \frac{64}{3}\, a1\, \pi^{6} + \frac{2048}{3}\, a7\, \pi^{12} + \frac{4096}{11}\, a6\, \pi^{11} + \frac{16384}{13}\, a8\, \pi^{13}$$

$$+ \frac{1024}{5}\, a5\, \pi^{10}, \frac{64}{3}\, a0\, \pi^{6} + \frac{16384}{13}\, a7\, \pi^{13} + 64\, a2\, \pi^{8} + \frac{4096}{11}\, a5\, \pi^{11} + \frac{1024}{9}\, a3\, \pi^{9} + \frac{256}{7}\, a1\, \pi^{7}$$

$$+ \frac{2048}{3}\, a6\, \pi^{12} + \frac{1024}{5}\, a4\, \pi^{10} + \frac{16384}{7}\, a8\, \pi^{14} + 64\, \pi^{5} - 320\, \pi^{3} + 480\, \pi \}$$

\>

```
> Res:=solve(Rov,Nezn);
```

$$Res := \{ a5 = -\frac{63063}{8}\, \frac{17145\, \pi^{2} + \pi^{6} - 375\, \pi^{4} - 133650}{\pi^{12}},$$

$$a6 = \frac{45045}{16}\, \frac{\pi^{6} - 378\, \pi^{4} + 17325\, \pi^{2} - 135135}{\pi^{13}}, a7 = -\frac{6435}{16}\, \frac{\pi^{6} - 378\, \pi^{4} + 17325\, \pi^{2} - 135135}{\pi^{14}},$$

$$a8 = 0, a4 = \frac{45045}{8}\, \frac{2\, \pi^{6} - 735\, \pi^{4} + 33390\, \pi^{2} - 259875}{\pi^{11}},$$

$$a2 = \frac{3465}{2}\, \frac{2\, \pi^{6} - 654\, \pi^{4} + 28665\, \pi^{2} - 221130}{\pi^{9}},$$

$$a3 = -\frac{17325}{2}\, \frac{-353\, \pi^{4} + \pi^{6} + 15834\, \pi^{2} - 122850}{\pi^{10}},$$

$$a1 = -315\, \frac{2\, \pi^{6} - 561\, \pi^{4} + 23595\, \pi^{2} - 180180}{\pi^{8}}, a0 = 9\, \frac{30030\, \pi^{2} + 4\, \pi^{6} - 770\, \pi^{4} - 225225}{\pi^{7}} \}$$

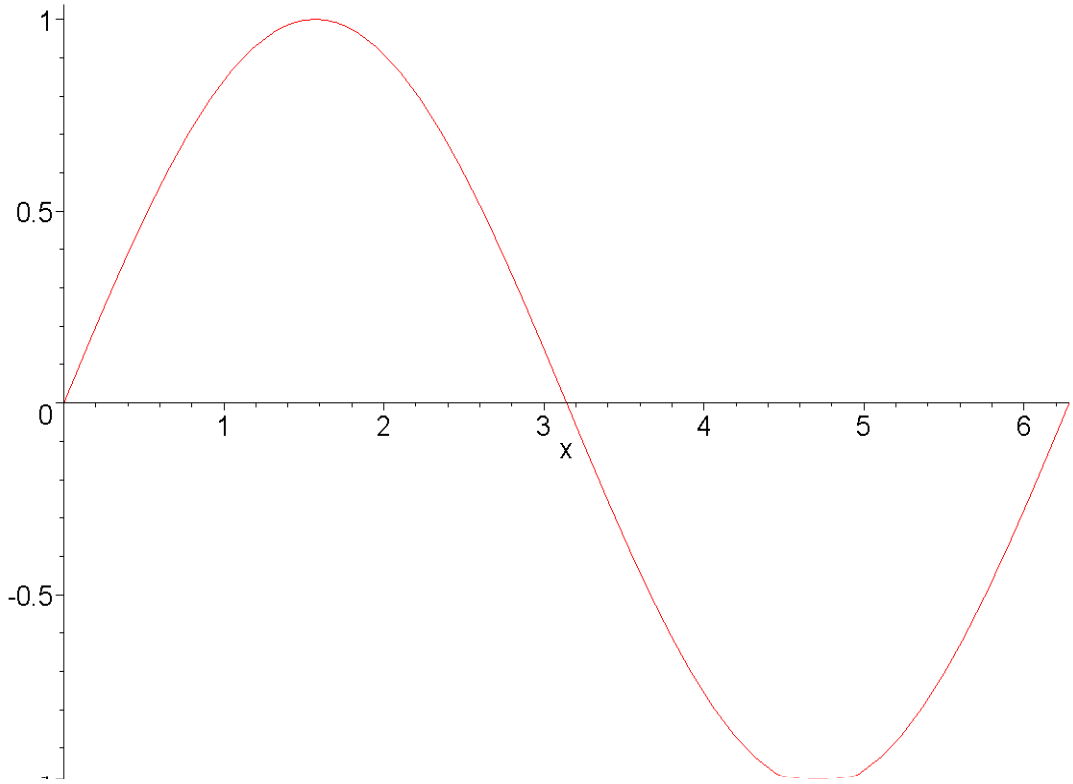
```
> F.N:=subs(Res,F);
```

$$F8 := 9\, \frac{30030\, \pi^{2} + 4\, \pi^{6} - 770\, \pi^{4} - 225225}{\pi^{7}} - 315\, \frac{(2\, \pi^{6} - 561\, \pi^{4} + 23595\, \pi^{2} - 180180)\, x}{\pi^{8}}$$

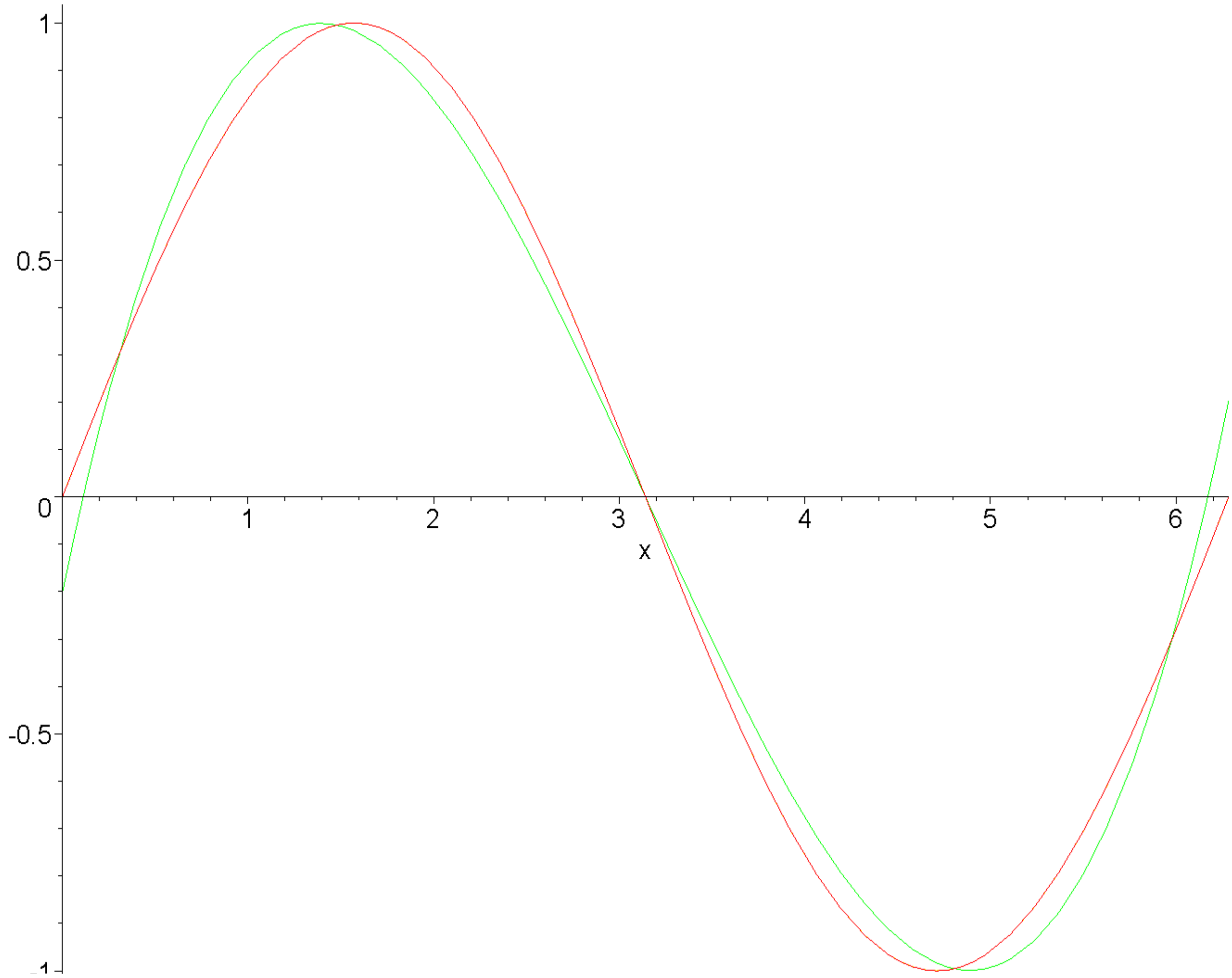
$$+ \frac{3465}{2}\, \frac{(2\, \pi^{6} - 654\, \pi^{4} + 28665\, \pi^{2} - 221130)\, x^{2}}{\pi^{9}}$$

$$-\frac{17325}{2}\frac{(-353\,\pi^4+\pi^6+15834\,\pi^2-122850)\,x^3}{\pi^{10}}$$
$$+\frac{45045}{8}\frac{(2\,\pi^6-735\,\pi^4+33390\,\pi^2-259875)\,x^4}{\pi^{11}}$$
$$-\frac{63063}{8}\frac{(17145\,\pi^2+\pi^6-375\,\pi^4-133650)\,x^5}{\pi^{12}}$$
$$+\frac{45045}{16}\frac{(\pi^6-378\,\pi^4+17325\,\pi^2-135135)\,x^6}{\pi^{13}}$$
$$-\frac{6435}{16}\frac{(\pi^6-378\,\pi^4+17325\,\pi^2-135135)\,x^7}{\pi^{14}}$$

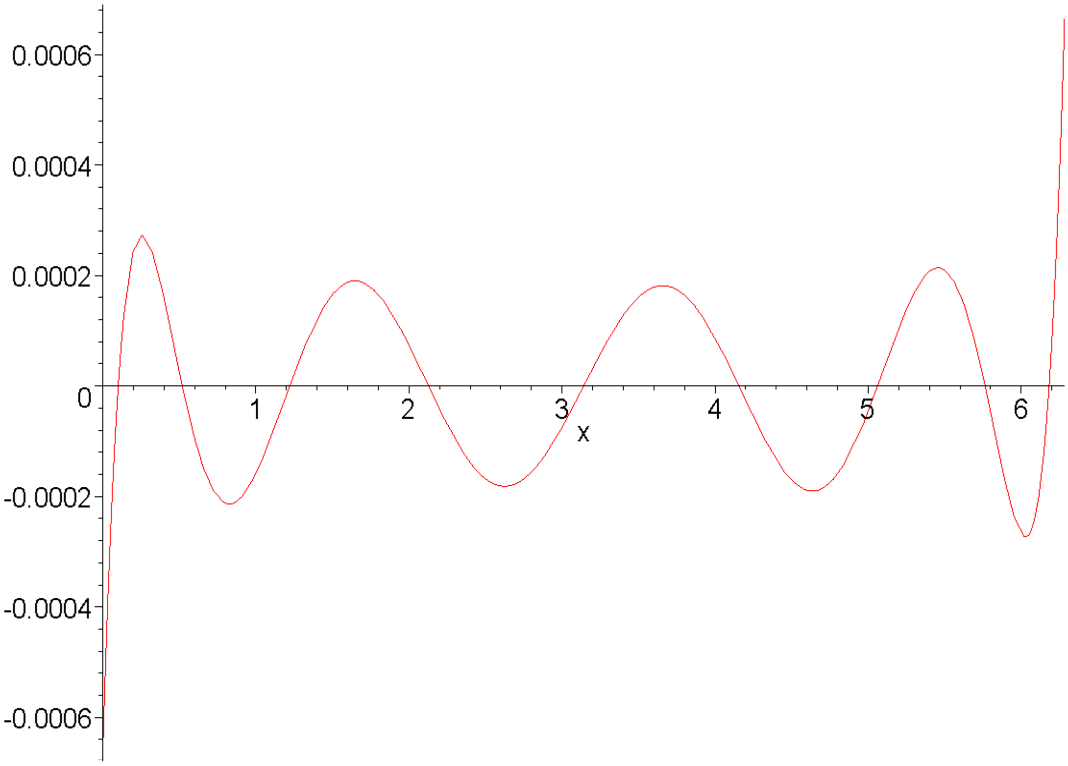
```
> plot(F.N,x=0..2*Pi);
```




```
> plot([F8,F4],x=0..2*Pi);
```




```
> plot(F8-sin(x),x=0..2*Pi);
```



```
>
```