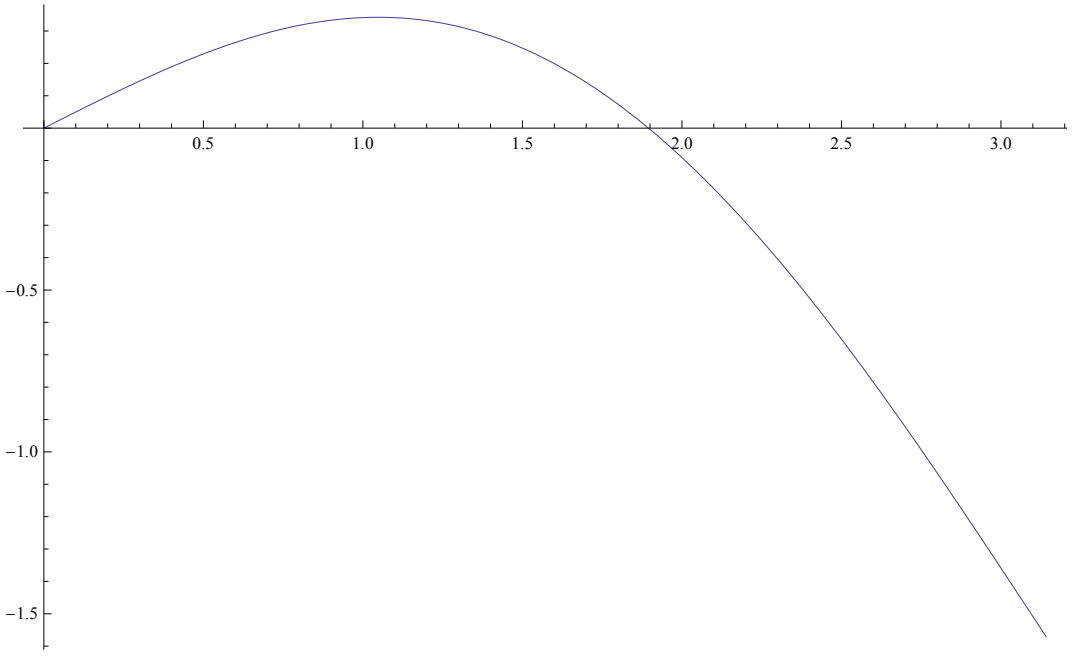
```
(* In this way you write comments *)
(* All commands with capital letters. Put ;
at end of each line if you don't want printing on the screen *)
(* Clear all variables is a good thing to avoid problems *)
Clear["`*"];
(* Below I give the outprint after each command  or commands*)
a = Sqrt[2];
Print[a]
```

$\sqrt{2}$

```
(* calculate integral of x^2 from zero to Pi *)
Integrate[x^2, {x, 0, Pi}]
```

$\frac{\pi^3}{3}$

```
(* Note the various forms of brackets *)
(* Defining a function f with _ and := *)
f[x_] := Sin[x] - (x / 2);
Plot[f[x], {x, 0, Pi}]
```



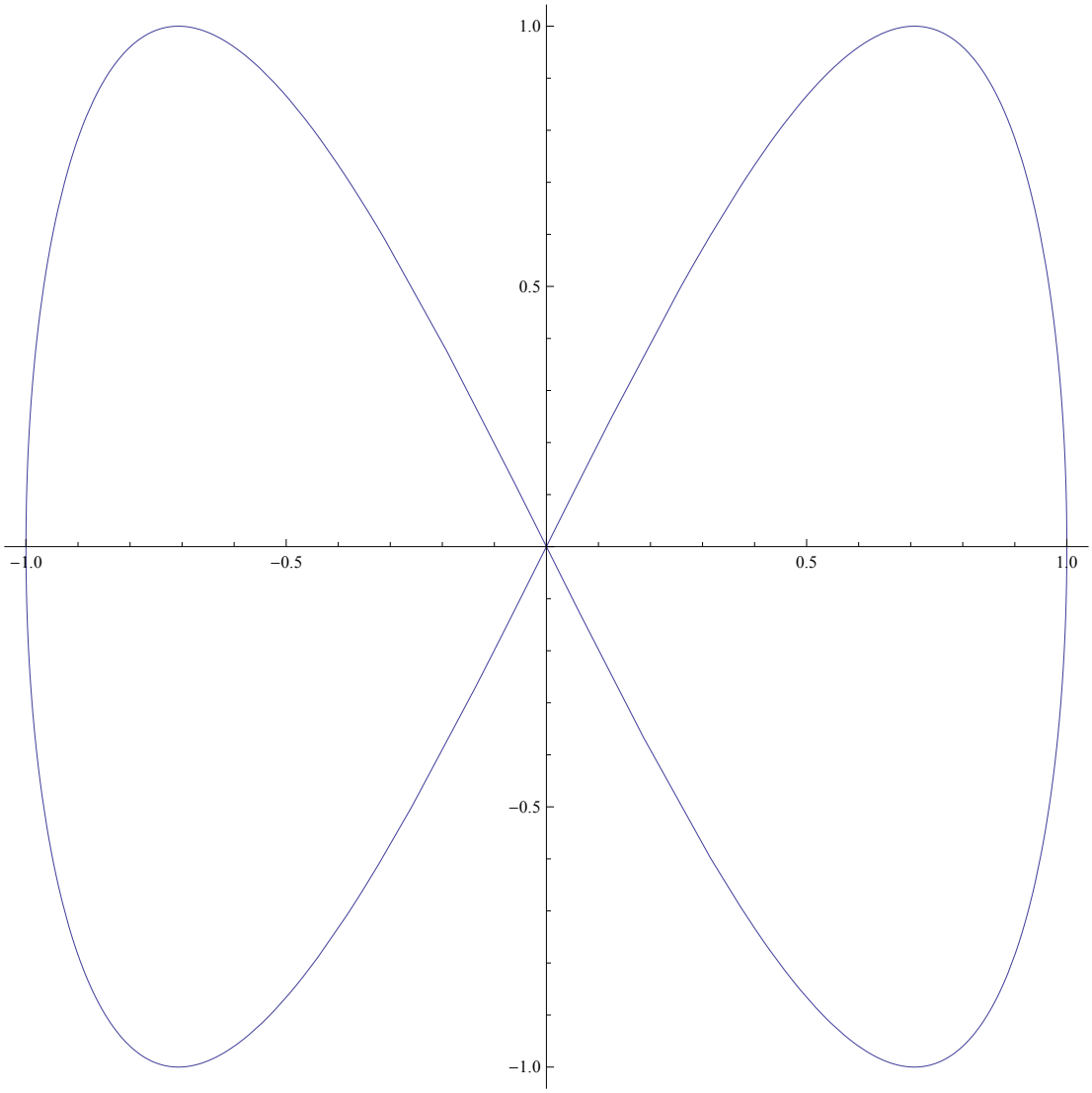

```
(* Solving equations with Solve. Numerical solution with NSolve. For non-
  algebraic equations FindRoot is better. Here I
   am looking for a root near 1.9. Note == sign *)
FindRoot[f[x] == 0, {x, 1.9}]
{x → 1.895494267033981}

(* Here is a function of three vaiables *)
g[x_, y_, z_] := x^2 - 2 y z + y + x z;
Print["g(1,2,3)=", g[1, 2, 3]]
"g(1,2,3)="-6

(* 3x 3 matrix A, row by row *)
a = {{1, 2, 3}, {2, 5, 6}, {3, 6, 9}};
(* With these commands you get eigenvalues and eigenvectors *)
Eigenvalues[a]
```

```
Eigenvectors[a]
```

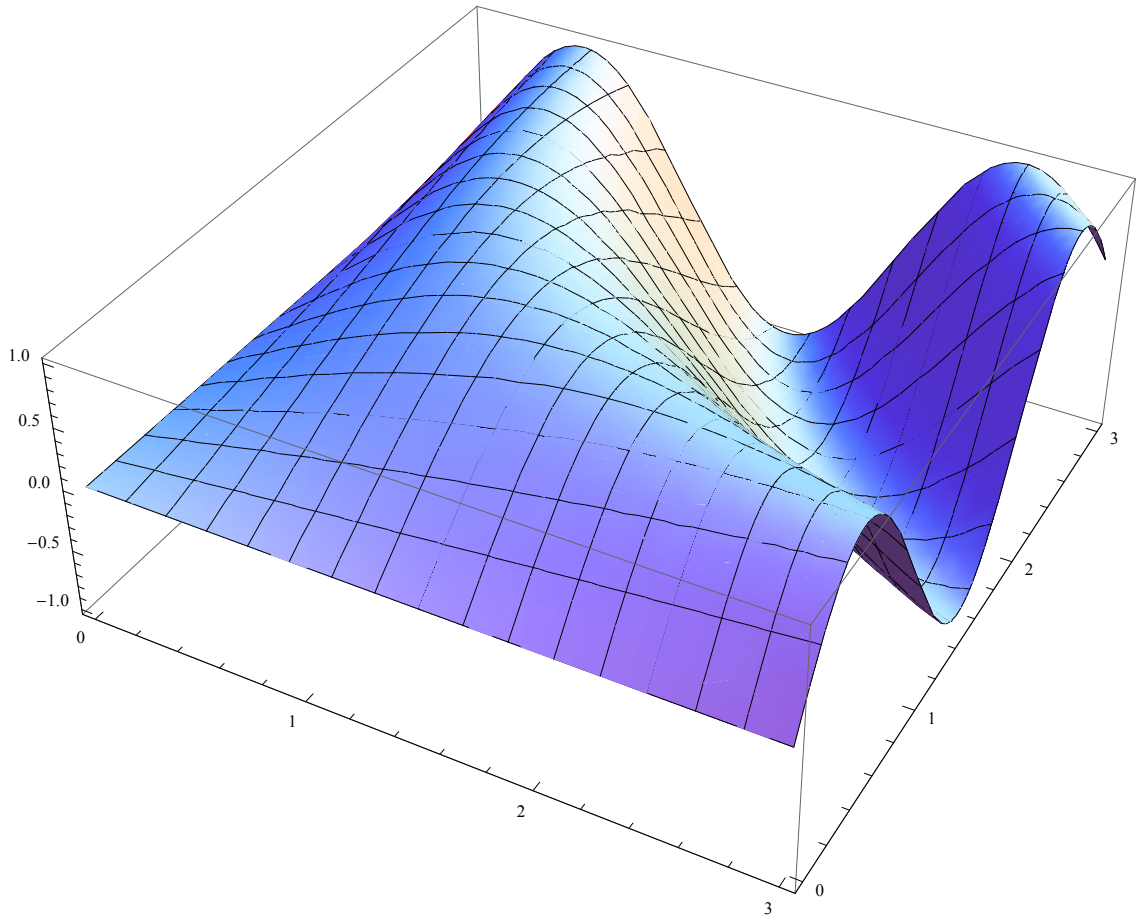
$$\left\{\frac{1}{2}\left(15+\sqrt{185}\right),\ \frac{1}{2}\left(15-\sqrt{185}\right),\ 0\right\}$$

$$\left\{\left\{\frac{1}{3},\ \frac{1}{12}\left(-5+\sqrt{185}\right),\ 1\right\},\ \left\{\frac{1}{3},\ \frac{1}{12}\left(-5-\sqrt{185}\right),\ 1\right\},\ \{-3,\ 0,\ 1\}\right\}$$

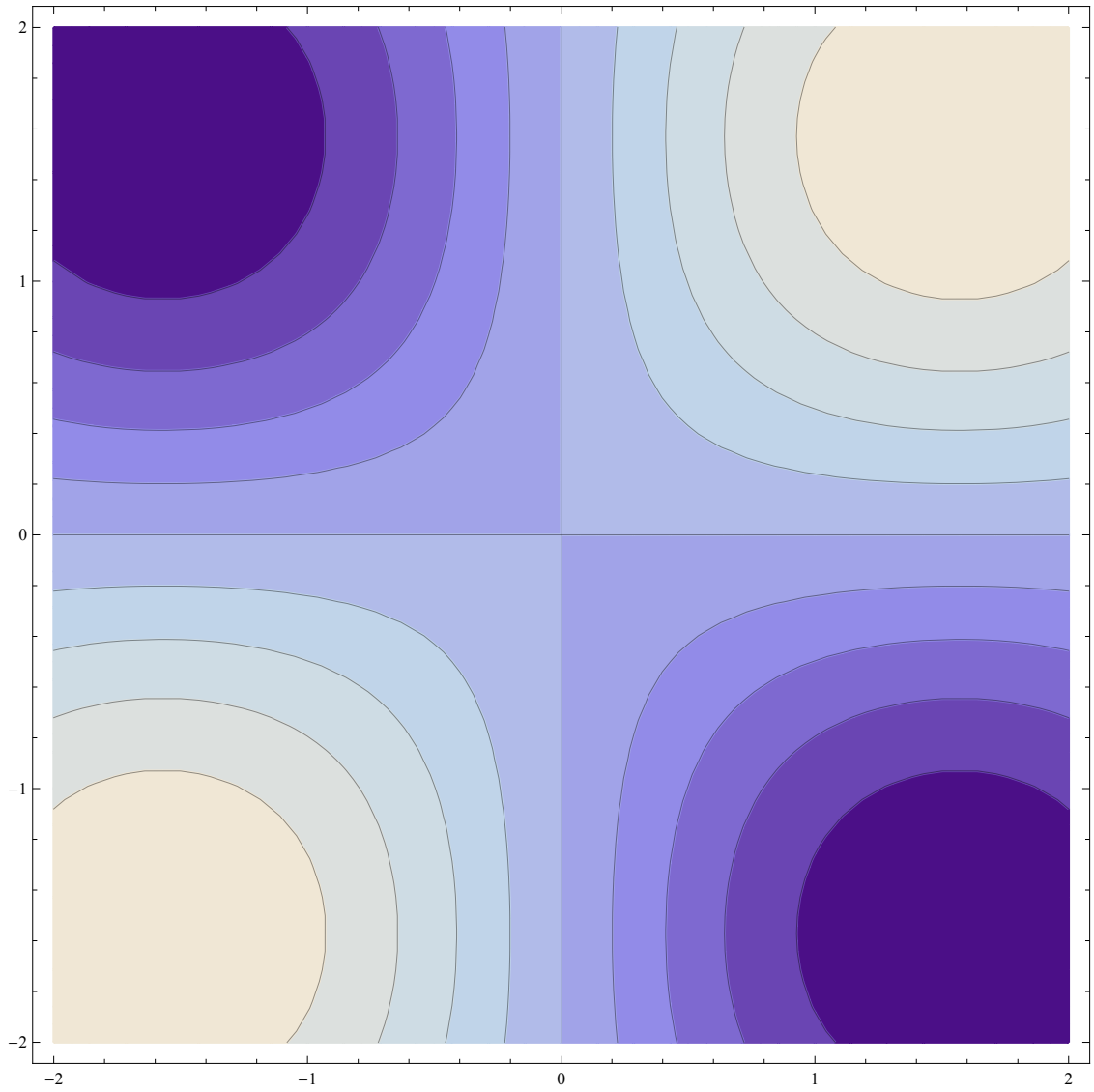
```
(* You can store data in a Table or an Array *)
Table[i^2, {i, 6}]
{1, 4, 9, 16, 25, 36}

m = Table[i - j, {i, 2}, {j, 2}];
m[[1, 2]]
-1

(* Creates a vector p and a matrix a1. You can
 for example give them values. See programming below*)
Array[p, 5]
Array[a1, {2, 4}]
{p[1], p[2], p[3], p[4], p[5]}
{{a1[1, 1], a1[1, 2], a1[1, 3], a1[1, 4]}, {a1[2, 1], a1[2, 2], a1[2, 3], a1[2, 4]}}

(* Sum 1+ 1/4 +.........+1/n^2 up to n=
 100. Out comes a numerical value due to N. N[1/3]=
  0.333333. Percent sign % means previous result *)
Sum[1 / j^2, {j, 1, 100}];
N[%]
1.6349839001848927

(* Numerical integration of a double integral. *)
NIntegrate[x^2 + y^2, {x, 0, 1}, {y, 0, 1}]
0.6666666666666666

(* You have aleardy seen Plot. Other possibilities are ParametricPlot,
Plot3D and ContourPlot *)
ParametricPlot[{Sin[t], Sin[2 t]}, {t, 0, 2 Pi}]
```




```
Plot3D[Sin[x y], {x, 0, 3}, {y, 0, 3}]
```




```
ContourPlot[Sin[x] Sin[ y], {x, -2, 2}, {y, -2, 2}]
```




```
(* At last some programming *)
(* Outprint of 2,4,6,8 *)
Print["even numbers between 2 to 8"];
Do[Print[i], {i, 2, 8, 2}]
"even numbers between 2 to 8"
2
4
6
8
```

```
(* Outprint of even numbers 2-8 and odd 9-16 *)
Print["even numbers between 2 to 8 and odd between 9 to 16"];
Do[If[i < 9, Print[i], Print[i - 1]], {i, 2, 16, 2}]

"even numbers between 2 to 8 and odd between 9 to 16"
2
```

```
4
6
8
9
11
13
15
(* While and For are also very useful *)
(* s=1+2+3+4+5 calculated with For and s=1+2+3+4+5+6 with While*)

s = 0;
For[i = 1, i ≤ 5, i++, s = s + i];
Print["s=", s]
"s="15

k = 0;
s = 0;
While[k < 6,
  k = k + 1;
   s = s + k];
Print["s=", s]
"s="21
```