Scilab

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Graphics
Plotting functions of . . .
Graph Titles
Multiple Graphs
Identify Graphs
Vector Field
Use scilab figures in LaTeX

1. Graphics

Let us start with simple graphics command

```
--t=-%pi:0.1:%pi;

--size(t)
 ans  =

    1.    63.

--plot(sin(t))
```

t is a vector given. We check size of the vector with `size` command.

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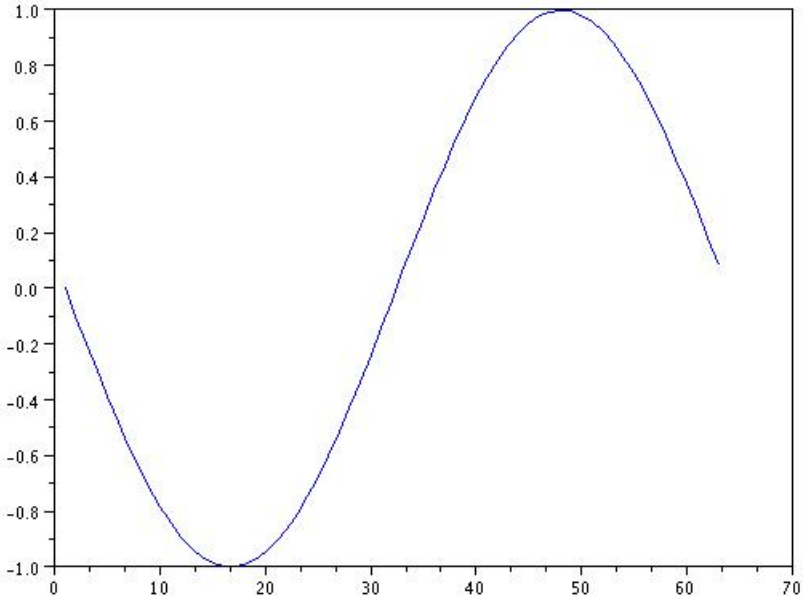

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Try some known graphs:

- $\cos(x)$
- x^2
- $\exp(x)$

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$$y = 3x + x \sin x$$

```
--deff('[y]=f2(x)','y=3*x+x.*sin(x)')
--x=1:.5:100;
 --y=f2(x);

 --plot(x,y)
```


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Try with **Help**:

- plot2d(x,y)
- fplot2d(x,f)
- subplot : Multiple graphs
- xgrid :
- xtitle :
- xclear : Clears one or more windows
- clf() : Clears the grpahic window
- xbasc: Clears graphic window and erase recorded graphics

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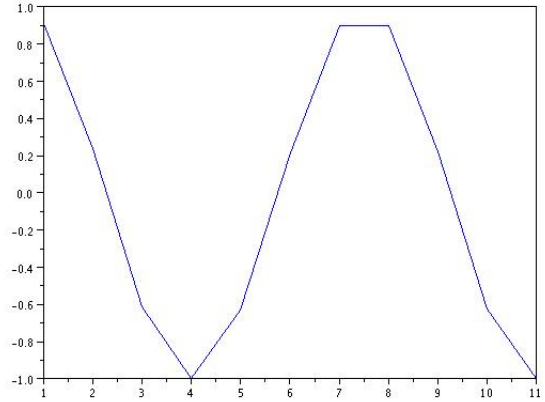
Points to note

- Choice of good interval for the graph is imporatant.
- Smoothness of the graph changes with number of points cosdiered in the given interval. Always check size of the vector you are using for plotting.



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- Also check for zeros of the function and make sure that you want to include it in the interval or exclude it.
- Before drawing check what you have asked to draw.
- You will be happy to see the figure which you already thought.

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2. Plotting functions of two variables

To obtain 3-D figure for the equation $z = x^4 - y^4$. Note that command **fplot3d** has arguments as x, y and the function f.

```
--deff('z=f(x,y)','z=x^4-y^4')

--x=-3:0.2:3 ;y=x ;

--clf() ;fplot3d(x,y,f)
```


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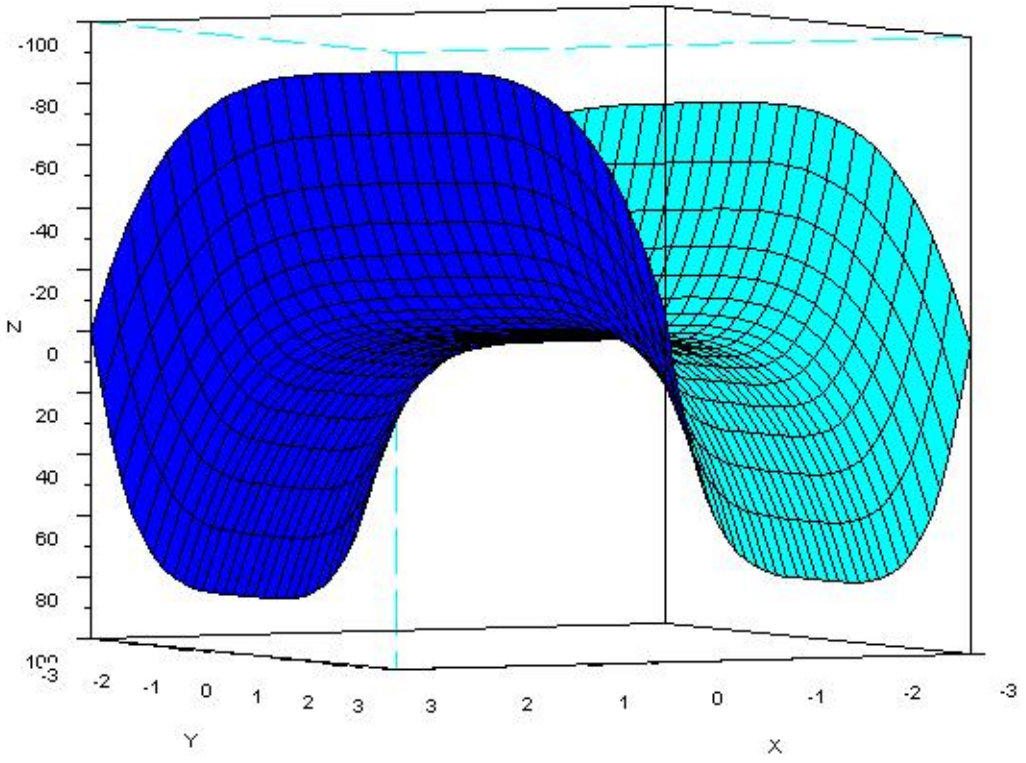
-100
-80
-60
-40
-20
Z
0
20
40
60
80
100
-3
-2
-1
0
1
2
3
Y
3
2
1
0
-1
-2
-3
X

```
--deff('z=f(x,y)','z=x^3-y^3')
Warning :redefining function: f


--x=-3:0.2:3 ;y=x ;

--clf() ;fplot3d(x,y,f)
```


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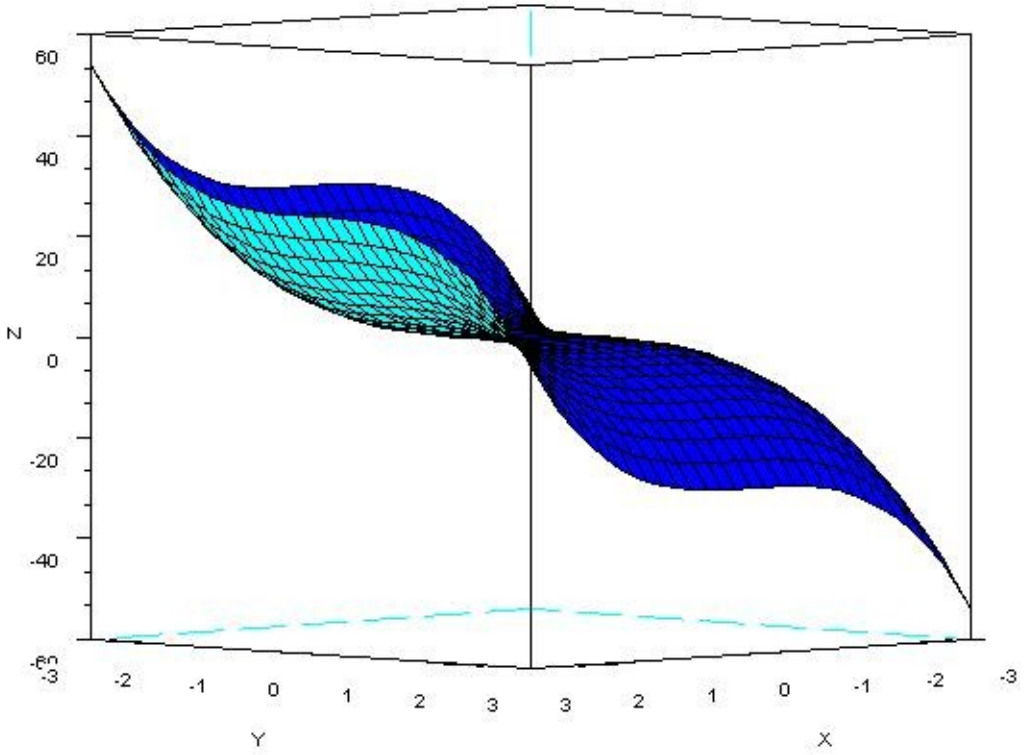
60
40
20
Z
0
-20
-40
-60
-3
-2
-1
0
1
2
3
Y
3
2
1
0
-1
-2
-3
X

$$z = \sin(x^2) - y^2$$

```
--deff('z=f(x,y)','z=sin(x^2)-y^2')

--x=-3:0.2:3 ;y=x ;

--clf() ;fplot3d1(x,y,f)
```


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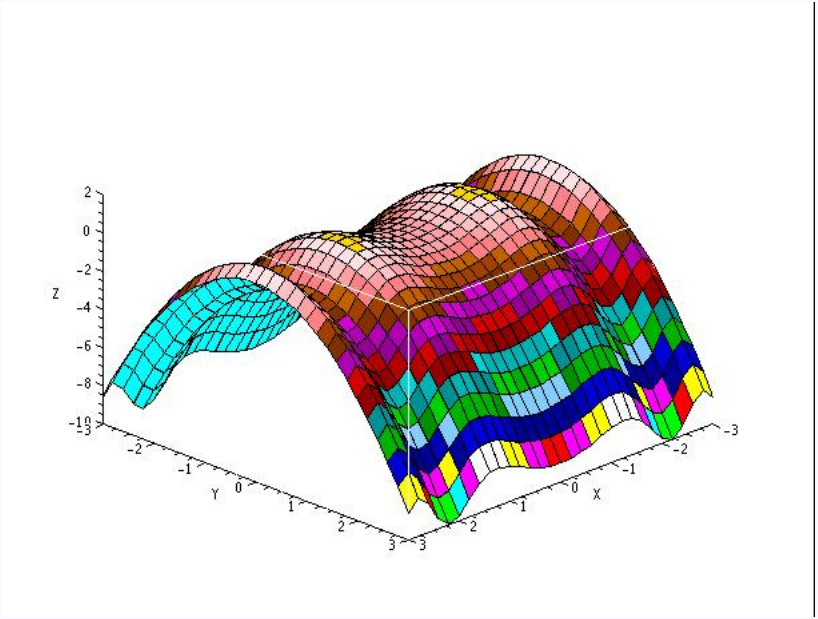

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3. Graph Titles

We can label X-axis, Y-axis and assign title for the graph:

```
--xlabel('X');

--ylabel(' Y-axis');

--xtitle(' Graph of sin(x)');
--plot(sin(x))
```

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4. Multiple Graphs

We want to compare some graphs. With same set of points. In that case, we can have more than one graph at a time.

```
> x=-2:.01:2
> y=x.^3
> z=x.^5
> w= sin(x)
> plot(x,y,x,z,x,w)
```

Observe the ooccurrence of x for each of the function in the plot command.

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5. Identify Graphs

Though, there are different colours for each graph, since there are more than one graph in one graph window. We would like to know which graphs goes to which function.
for that 'legend' command can be used.

```
> legend('x^3','x^5','sin(x)')
```

Will put colour marks with the function name.

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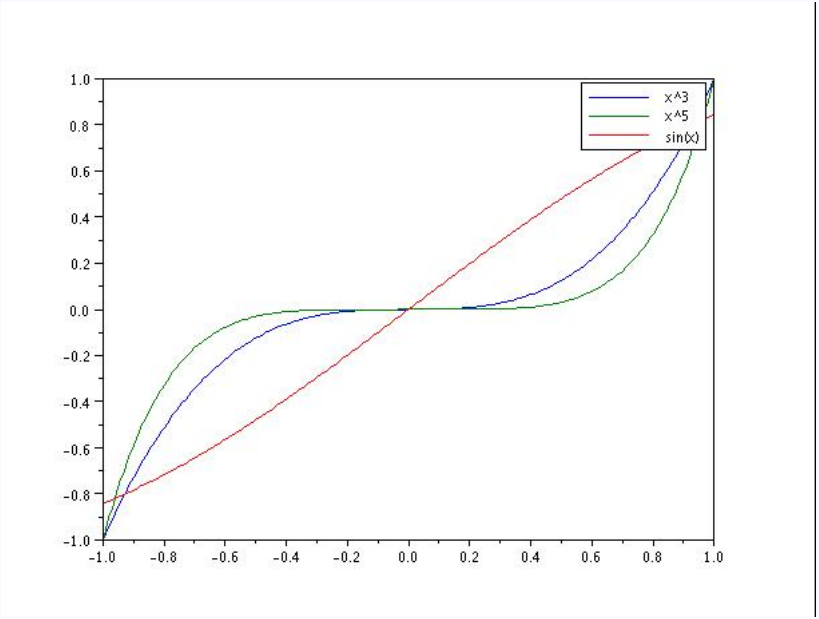

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6. Vector Field

To plot vector field of

$$F(x,y) = x\vec{\boldsymbol{i}} + (x^2+y^2)\vec{\boldsymbol{j}}$$

Note that coefficient function of $\vec{\boldsymbol{i}}$ is x. Coefficient function of $\vec{\boldsymbol{j}}$ is x^2+y^2. To define these function use `deff` the Scilab keyword.

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```
--  deff('[vx]=fx(x,y)','vx=x')

--- deff('[vy]=fy(x,y)','vy=x^2+y^2')
```

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Define vector x and y.

```
> x=linspace(-2,11,11);
> y=linspace(-2,11,11);
```

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Evaulate fx and fy at values of x and y.
For each of x there will be y. So there will be 11×11 order pairs of (x, y)
Evaluate (fx, fy) for all order pairs of x and y.

```
vx=feval(x,y,fx);

vy=feval(x,y,fy);
```

Now function vx calculated at each grid point (x, y) same with function vy.

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With the command `champ` actual plotting of vector field

```
> champ (x,y,vx,vy)
```

Plots grid points and then plots points calculated at those grid points for function vx and vy.
`champ` joins it as a vector. Initial point of a vector is grid point and direction can be shown with the calculated point.

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6.1. Full code

```
--deff('[vx]=fx(x,y)','vx=x')
--deff('[vy]=fy(x,y)','vy=x^2+y^2')
--vx=feval(x,y,fx);
--vy=feval(x,y,fy);
--champ(x,y,vx,vy)
```

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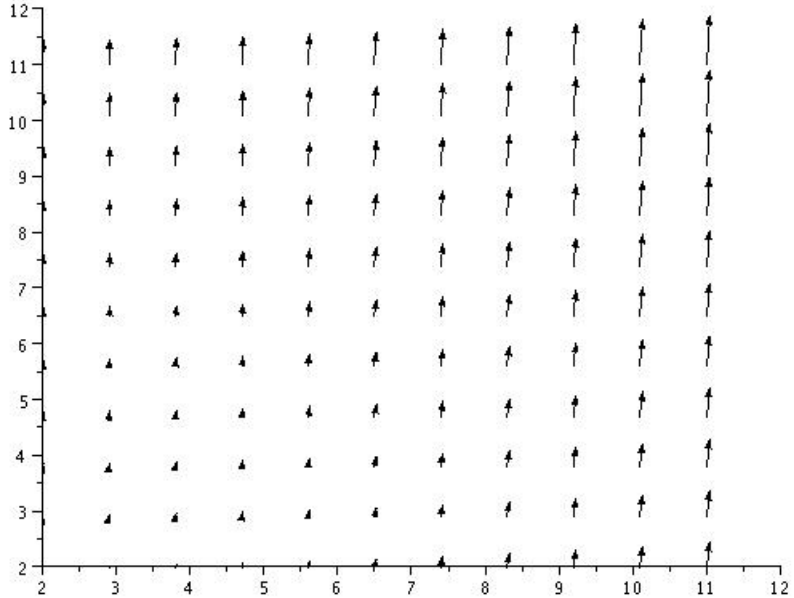

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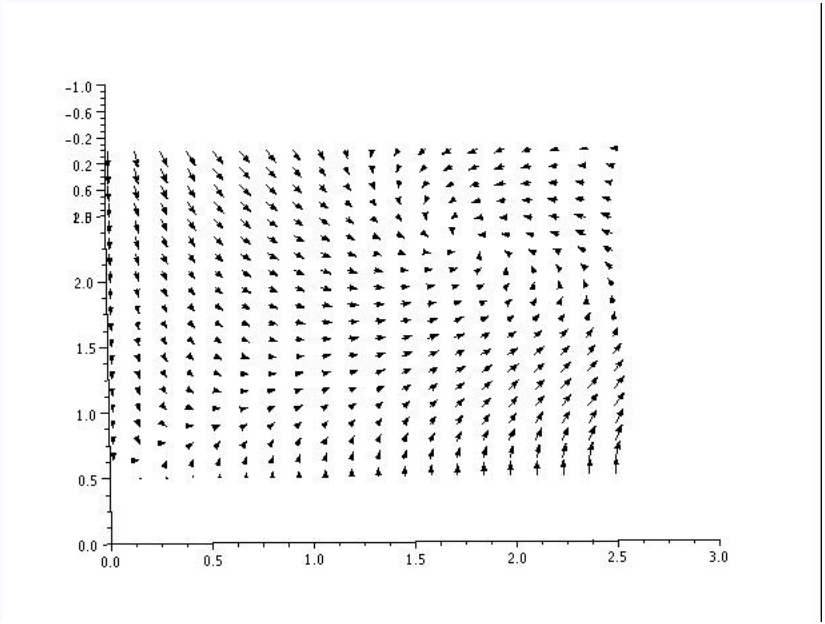
Try:

1. $F(x,y) = y^2\vec{i} + (x/10)\vec{j}$ in the rectangle $0 < x < 2,\ 1 < y < 2$.

2. $F = \sin(xy)\vec{i} + (x-y)\vec{j}$ with $0 < x < 2.5,\ 1 < y < 2.5$.



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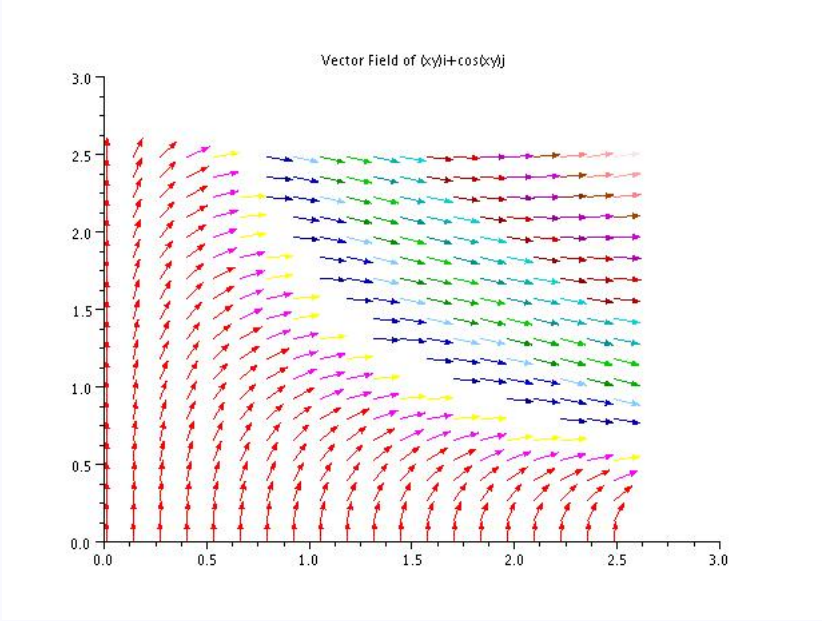
3. $F(x,y) = xy\vec{\boldsymbol{i}} + \cos(xy)\vec{\boldsymbol{j}}$.



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`contour` draws level curves of the given surface. It compute max and min for the surface. Then divide open interval (min, max) into number of level curves we asked for. Accordingly it draws the contour.

```
contour(x,y,z,5)
```

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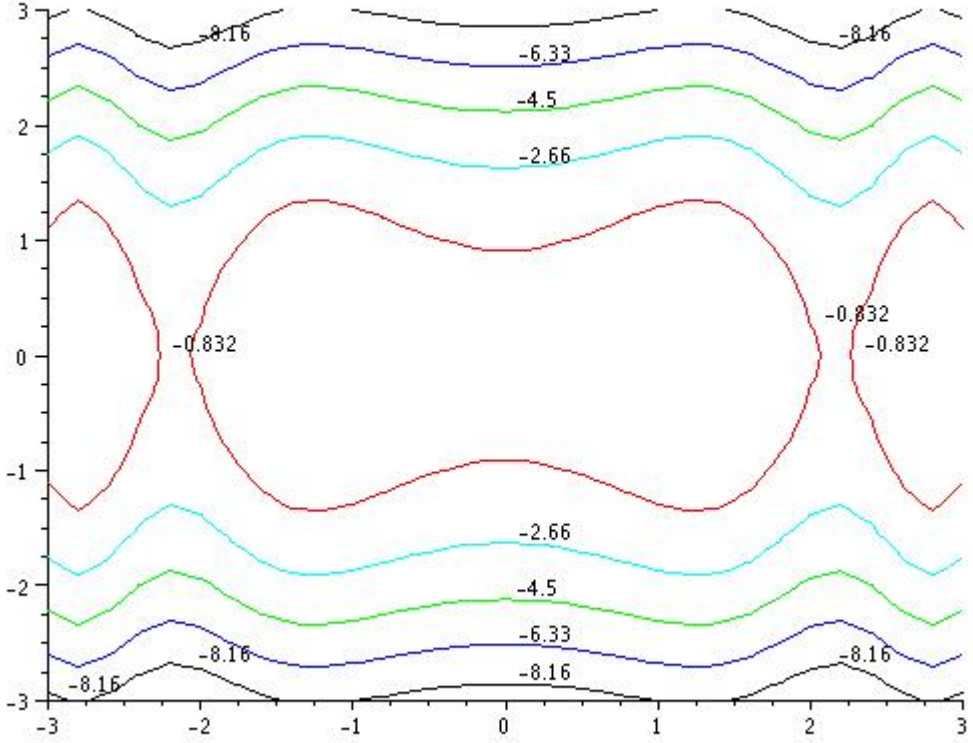
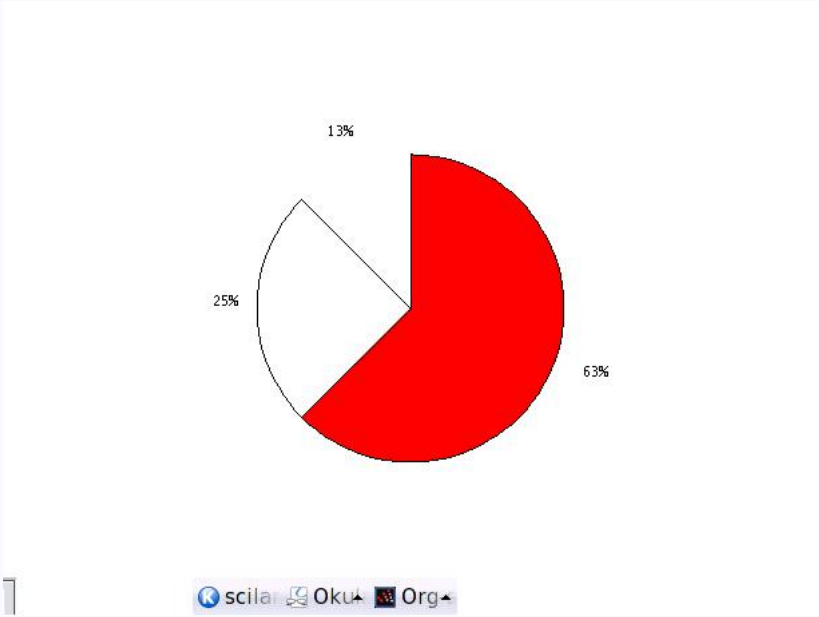

-8.16
-6.33
-4.5
-2.66
-0.832
-0.832
-0.832
-2.66
-4.5
-6.33
-8.16
-8.16
-8.16
-8.16
3
2
1
0
-1
-2
-3
-3
-2
-1
0
1
2
3

Pie graph




```
pie([1, 2, 5])
```

since 1+2+5=8, we will see a circle divided in to 8 parts, out of which 1, 2 and 5 parts are denoted by different colours.

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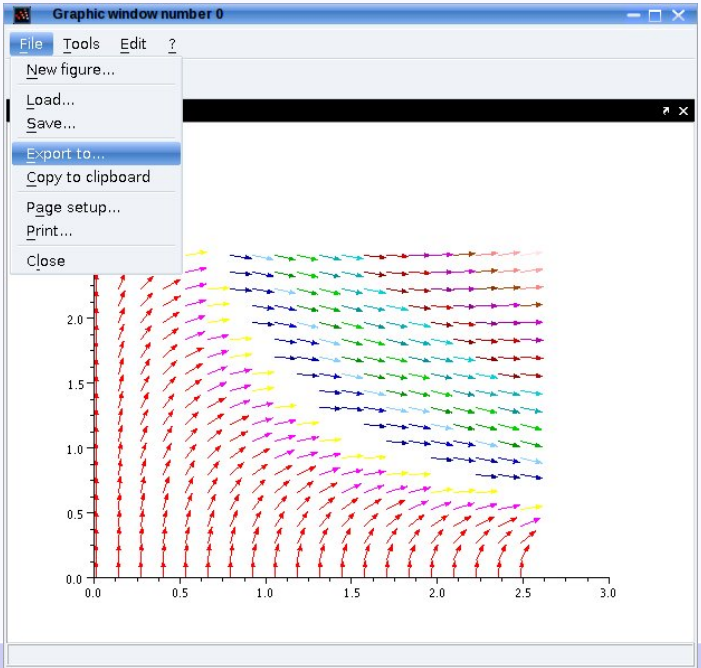
7. Use scilab figures in LaTeX

From graphics window of scilab, choose option form file menu 'export'.



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In LaTeX use commnad

```
\includegraphics{filename.jpg}
```

Make sure the path of the figure file given correctly.
Use `pdflatex` to convert TeX file to pdf.
Make sure that you have include graphics package in the preamble(before `\begin{document}`) of your TeX file.

```
\usepackage{graphicx}
```


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Thanks!

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