Graph(Plot) Functions

with(plots)

plot(f, h, v, options)

f - function(s) to be plotted

h - horizontal range

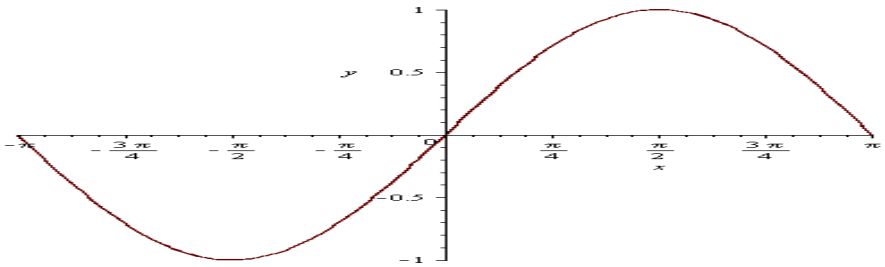
v - vertical range

The procedure plot in Maple accepts three function types:
1)a real function in a single variable expressed as an expression,

Ex:Graph f(x)= sin(x)for x in[-π..π]and y in [-1..1];

>with(plots)

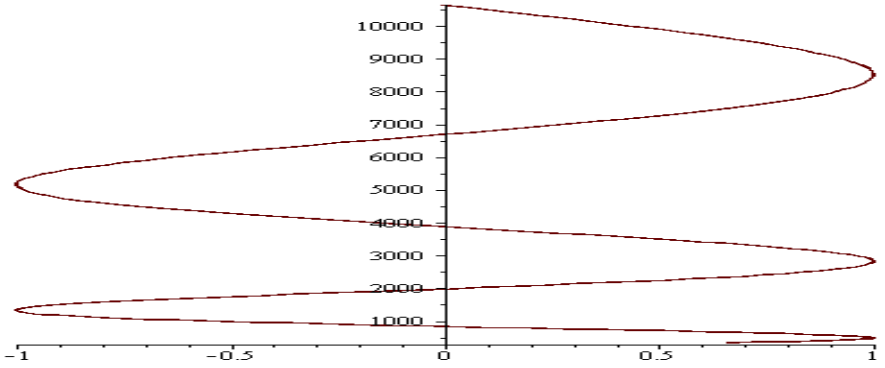
> plot(sin(x), x=-Pi..Pi, y=-1..1);



2) a Maple procedure, a parametric function, A parametric function has the form

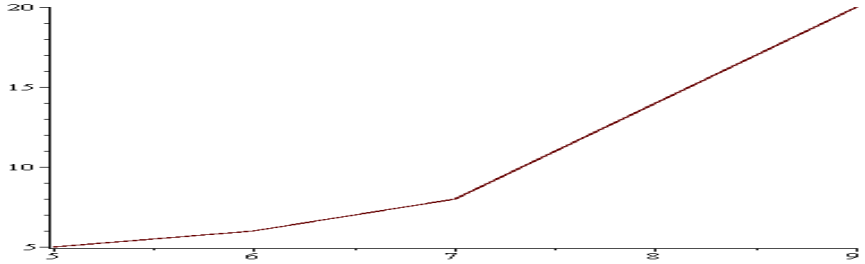
Plot([x(t),y(t)],t=a..b);

plot([sin(t), t^3, t=7..22]);

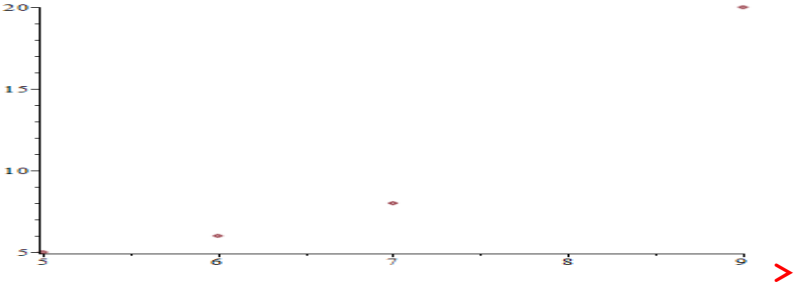


3) A list of points has the form $[[x1,y1],[x2,y2],...,[xn,yn]]$

```
> plot([[5,5], [6,6], [7,8], [9,20]]);
```

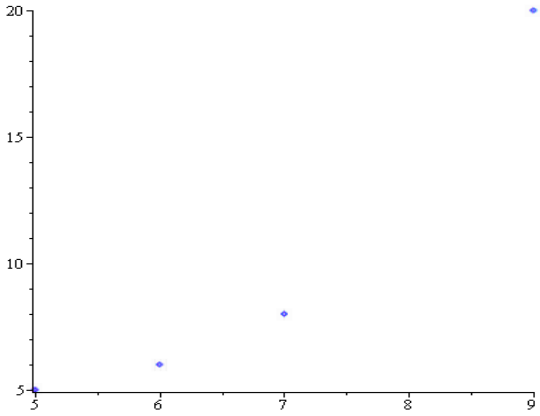


$plot([[5,5],[6,6],[7,8],[9,20]], style = point);$



>

$plot([[5,5],[6,6],[7,8],[9,20]], style = point, color = blue);$



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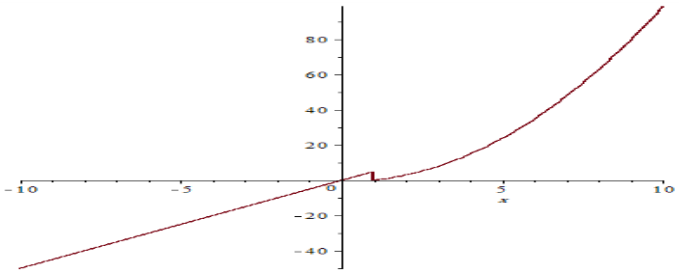
Example: **Graph** $\begin{cases} x^2 - 1 & 1 \le x \\ 5x & otherwise \end{cases}$

> $piecewise\left(x \ge 1, x^2 - 1, 5 \cdot x\right)$

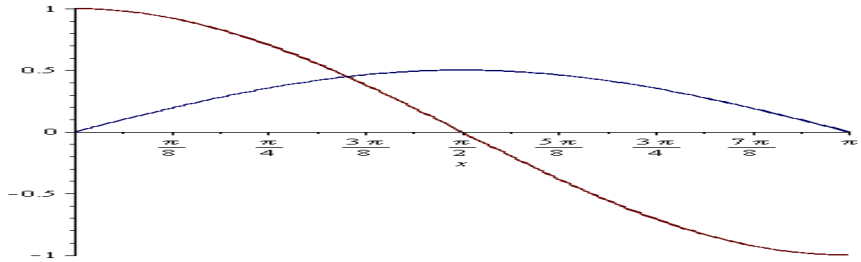
```
> plot(%);
```



Multiple plots (in a set or list):

Sketch the graph $y = cosx$, $y = \frac{1}{2}\,sinx$ **and** $y = sin3x$ **for** $0 \le x \le \pi$
in *one figure with different colors*

```
> with(plots) :
> plot([cos(x), 1/2 sin(x)], x = 0 ..Pi)
```



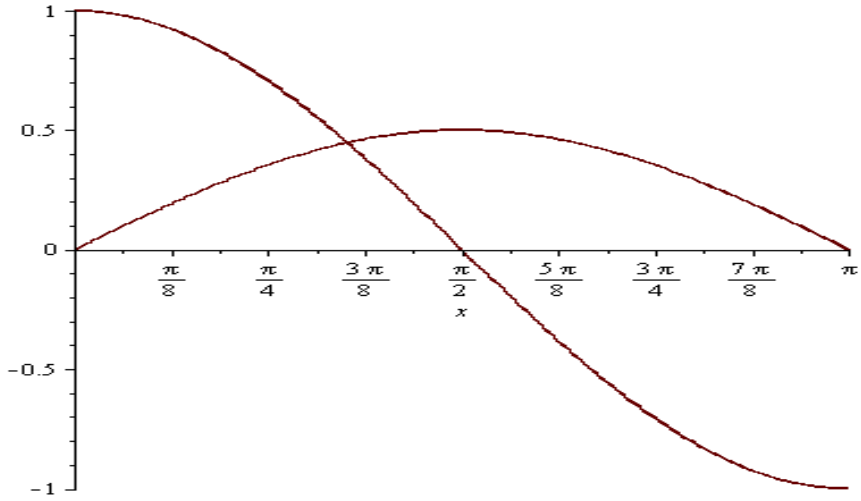

```
> p1 := plot(cos(x), x = 0 ..Pi)
```

$p1 := PLOT(\ldots)$

```
> p2 := plot(1/2 sin(x), x = 0 ..Pi)
```

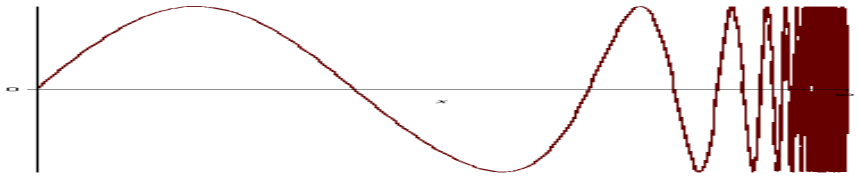
$p2 := PLOT(\ldots)$

```
> display(p1, p2)
```



Infinity plots: Ex:Graph **sin(x) forx >=0.**

```
> plot(sin(x), x=0..infinity);
```



Graph polar coordinates:

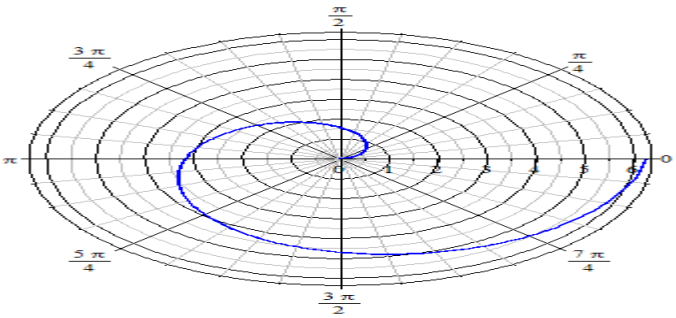
polarplot(expr, theta=a1..a2, opts)

expr	-	expression in theta
a1, a2	-	(optional) real constants
opts	-	plotting options

Ex:Graph r=1-cosθ in polar coordinates in [0,2π]with color blue.

> polarplot(1-cos($\theta), \theta = 0..2Pi, color = blue$);

> plot(1-cos($\theta), \theta = 0..2Pi, coords = polar, color = blue$);



Graph of complex function:

```
Complexplot3d(expr, t=a..b, xv, yv, options)
Complexplot3d(f, a..b, xv, yv, options)
Complexplot3d(L, xv, yv, options)
```

`expr` - algebraic; expression in parameter t defining a curve

`t` - name; curve parameter

`f` - procedure; procedure in one variable defining a curve

`a, b` - realcons; endpoints of parameter range

`L` - list; complex numbers specified as points

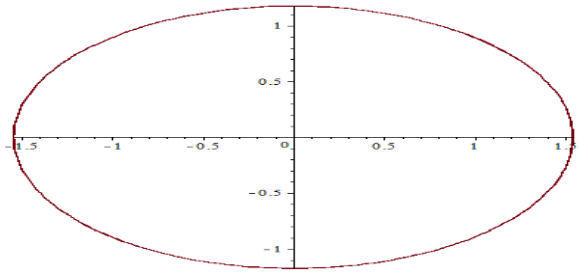
`xv` - (optional) range or name=range; view of horizontal axis

`yv` - (optional) range or name=range; view of vertical axis

`options` - (optional) sequence of equations; plot options

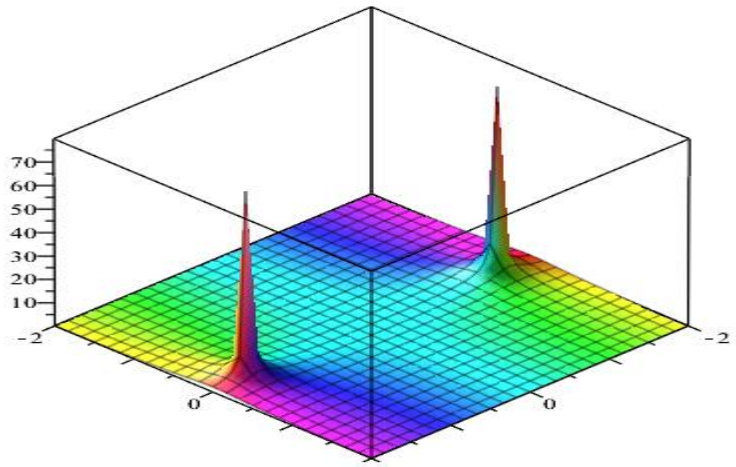
Graph complex function z=cos(x+i) for x in [-π, π].

$complexplot(\cos(x+I), x=-\mathrm{Pi}..\mathrm{Pi});$



Graph complex function $z=e^{(x+iy)}$ for 1-2 I to 1+2 i.

$$complexplot3d(\exp(x+Iy), 1-2I..3+2I)$$



Graph in three-dimensional

plot3d - three-dimensional plotting

`plot3d(expr, x=a..b, y=c..d, opts)`

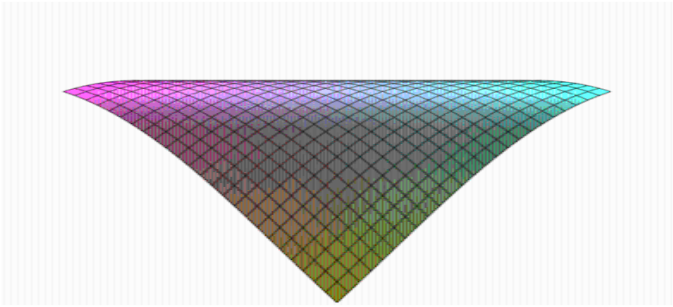
`plot3d([exprf, exprg, exprh], s=a..b, t=c..d, opts)`

Parameters

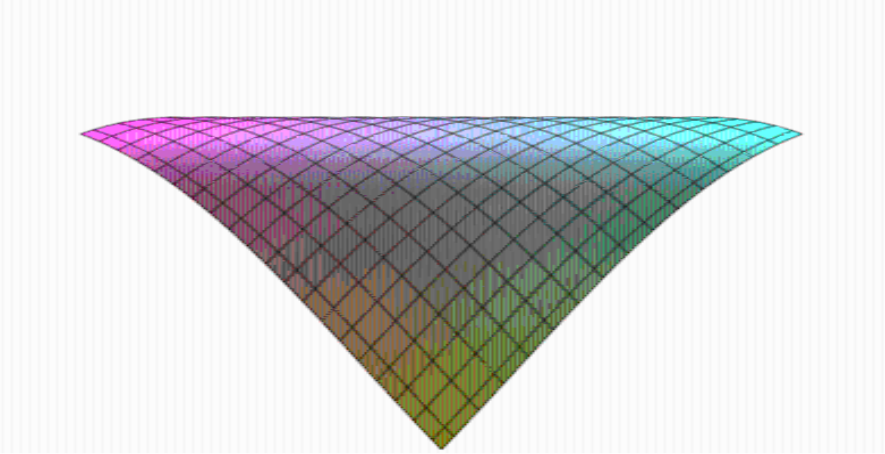
`expr`	-	expression in `x` and `y`
`f, g, h`	-	procedures or operators
`exprf, exprg, exprh`	-	expressions in `s` and `t`
`a, b`	-	real constants, procedures, or expressions in `y`
`c, d`	-	real constants, procedures, or expressions in `x`
`x, y, s, t`	-	names
`opts`	-	(optional) equations of the form `option=value` where `option` is described in plot3d/option

Ex:Graph f(x,y)=cos(x+y) for -1≤x≤1 any -1≤ y ≤ 1.

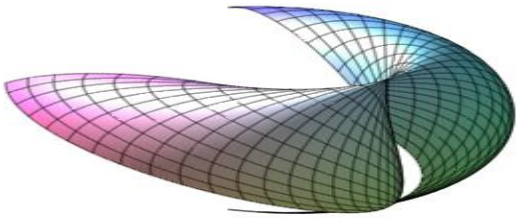
```
> with(plots):
> plot3d(cos(x+y),x=-1..1,y=-1..1);
```



> $plot3d(\cos(x+y), x=-1..1, y=-1..1, grid=[30,40]);$



> plot3d(cos(x+y), x = -1 .. 1, y = -1 .. 1, coords = spherical);



Ex:Graph f(x,y)=sin(xy) and g(x,y)=x+2y in one figure for $-\pi \le x \le \pi$ any $-\pi \le y \le \pi$ with colors blue and green resptively.

plot3d([sin(x*y), x + 2*y], x=-Pi..Pi, y=-Pi..Pi, color=[blue,green]);