

# gnuplot Quick Reference

(Copyright(c) Alex Woo 1992 June 1)  
Updated by Hans-Bernhard Bröker, April 2004

## Starting gnuplot

to enter gnuplot `gnuplot`  
to enter batch gnuplot `gnuplot macro_file`  
to pipe commands to gnuplot `application | gnuplot`  
see below for environment variables you might want to change before entering gnuplot.

## Exiting gnuplot

exit gnuplot `quit`  
All gnuplot commands can be abbreviated to the first few unique letters, usually three characters.  
This reference uses the complete name for clarity.

## Getting Help

introductory help `help plot`  
help on a topic `help <topic>`  
list of all help available `help or ?`  
show current environment `show all`

## Command-line Editing

The UNIX, MS-DOS and VMS versions of gnuplot support command-line editing and a command history. EMACS style editing is supported.

Line Editing:

move back a single character	<code>^ B</code>
move forward a single character	<code>^ F</code>
moves to the beginning of the line	<code>^ A</code>
moves to the end of the line	<code>^ E</code>
delete the previous character	<code>^ H and DEL</code>
deletes the current character	<code>^ D</code>
deletes to the end of line	<code>^ K</code>
redraws line in case it gets trashed	<code>^ L, ^ R</code>
deletes the entire line	<code>^ U</code>
deletes the last word	<code>^ W</code>

History:

moves back through history	<code>^ P</code>
moves forward through history	<code>^ N</code>

The following arrow keys may be used on most PC versions if READLINE is used.

IBM PC Arrow Keys:

Left Arrow	same as <code>^ B</code>
Right Arrow	same as <code>^ F</code>
Ctrl Left Arrow	same as <code>^ A</code>
Ctrl Right Arrow	same as <code>^ E</code>
Up Arrow	same as <code>^ P</code>
Down Arrow	same as <code>^ N</code>

## Graphics Devices

All screen graphics devices are specified by names in a startup file (.gnuplot in UNIX). If you change the **replot** command or recreate it repeating the load command

get a list of valid devices

Graphics Terminals:

Mac OS X	s
AED 512 Terminal	s
AED 767 Terminal	s
Amiga	s
Adobe Illustrator 3.0 Format	s
Apollo graphics primitive, rescalable	s
Atari ST	s
BBN Bitgraph Terminal	s
SCO CGI Driver	s
Apollo graphics primitive, fixed window	s
SGI GL window	s
MS-DOS Kermit Tek4010 term - color	s
MS-DOS Kermit Tek4010 term - mono	s
NeXTstep window system	s
OS/2 Presentation Manager	s
REGIS graphics language	s
Selinar Tek Terminal	s
SunView window system	s
Tektronix 4106, 4107, 4109 & 420X	s
Tektronix 4010; most TEK emulators	s
VAX UIS window system	s
VT-like tek40xx terminal emulator	s
UNIX plotting (not always supplied)	s
AT&T 3b1 or 7300 UNIXPC	s
MS Windows	s
X11 default display device	s
X11 multicolor point default device	s

Turbo C PC Graphics Modes:

Hercules	s
Color Graphics Adaptor	s
Monochrome CGA	s
Extended Graphics Adaptor	s
VGA	s
Monochrome VGA	s
Super VGA - requires SVGA driver	s
AT&T 6300 Micro	s

Hardcopy Devices:

Unknown - not a plotting device	s
Dump ASCII table of X Y [Z] values	s
printer or glass dumb terminal	s
Roland DXY800A plotter	s

Dot Matrix Printers

Epson-style 60-dot per inch printers	s
Epson LX-800, Star NL-10	s
NX-1000, PROPRINTER	s
NEC printer CP6, Epson LQ-800	s
Star Color Printer	s
Tandy DMP-130 60-dot per inch	s
Vectrix 384 & Tandy color printer	s

## Laser Printers

Talaris EXCL language	<code>set term excl</code>
Imagen laser printer	<code>set term imagen</code>
LN03-Plus in EGM mode	<code>set term ln03</code>
PostScript graphics language	<code>set term post [mode color 'font' size]</code>
CorelDraw EPS	<code>set term corel [mode color 'font' size]</code>
Prescribe - for the Kyocera Laser Printer	<code>set term prescribe</code>
Kyocera Laser Printer with Courier font	<code>set term kyo</code>
QMS/QUIC Laser (also Talaris 1200 )	<code>set term qms</code>

## Metafiles

AutoCAD DXF (120x80 default)	<code>set term dxf</code>
FIG graphics language: SunView or X	<code>set term fig</code>
FIG graphics language: Large Graph	<code>set term bfig</code>
SCO hardcopy CGI	<code>set term hcgi</code>
Frame Maker MIF 3.0	<code>set term mif [pentype curvetype help]</code>
Portable bitmap	<code>set term pbm [fontsize color]</code>
Uniplex Redwood Graphics Interface Proto-	<code>set term rgip</code>

col  
TGIF language

`set term tgif`

## HP Devices

HP2623A and maybe others	<code>set term hp2623A</code>
HP2648 and HP2647	<code>set term hp2648</code>
HP7580, & probably other HPs (4 pens)	<code>set term hp7580B</code>
HP7475 & lots of others (6 pens)	<code>set term hpgl</code>
HP Laserjet series II & clones	<code>set term hpljii [75 100 150 300]</code>
HP DeskJet 500	<code>set term hpdj [75 100 150 300]</code>
HP PaintJet & HP3630	<code>set term hppj [FNT5X9 FNT9X17 FNT13x25]</code>
HP laserjet III ( HPGL plot vectors)	<code>set term pcl5 [mode font fontsize ]</code>

## TeX picture environments

LaTeX picture environment	<code>set term latex</code>
EEPIC – extended LaTeX picture	<code>set term eepic</code>
LaTeX picture with emTeX specials	<code>set term emtex</code>
PSTricks macros for TeX or LaTeX	<code>set term pstricks</code>
TPIC specials for TeX or LaTeX	<code>set term tpic</code>
MetaFont font generation input	<code>set term mf</code>

## Saving and restoring terminal

restore default or pushed terminal	<code>set term pop</code>
save (push) current terminal	<code>set term push</code>

## Commands associated to interactive terminals

change mouse settings	<code>set mouse</code>
change hotkey bindings	<code>bind</code>

## Files

<b>plot</b> a data file	<code>plot 'fspec'</code>
<b>load</b> in a macro file	<code>load 'fspec'</code>
<b>save</b> command buffer to a macro file	<code>save 'fspec'</code>
<b>save settings</b> for later reuse	<code>save set 'fpec'</code>

## PLOT & SPLOT commands

**plot** and **splot** are the primary commands **plot** plots 2-d surfaces and data. **splot** plots 3-d surfaces and data.

Syntax:

`plot {ranges} <function> {title}{style} {, <function>}`

`splot {ranges} <function> {title}{style} {, <function>}`

where <function> is either a mathematical expression or a pair (**plot**) or triple (**splot**) of mathematical expressions. User-defined functions and variables may also be used.

## Plotting Data

Discrete data contained in a file can displayed by using the **plot** command. Data is read from a file in quotes) on the **plot** or **splot** command line. Data is read from a file in quotes) on the **plot** or **splot** command line. Data is read from a file in quotes) on the **plot** or **splot** command line. Lines beginning with # (or ! on VMS) will be ignored. Each data point represents an (x,y) pair. For **splot** with error bars (see **plot errorbars**), each data point is given as (x,y,xlow,xhigh), (x,y,xdelta,ydelta), or (x,y,xlow,yhigh). Each line of a data file must be separated by blank lines.

For **plots** the x value may be omitted, and for **splots** either case the omitted values are assigned the current values. The values start at 0 and are incremented for each data point.

## Surface Plotting

Implicitly, there are two types of 3-d datafiles. If a datafile is assumed to be a grid data, i.e., the data has a grid in the x-y direction (the ith cross isoline passes thru the ith column), then a grid is drawn for grid data. (Note contouring is available for grid data. If the data is the same length, no cross isolines will be drawn and a surface plot will be drawn.)

## Using Pipes

On some computer systems with a popen function, data can be piped through a shell command by starting the file name with a shell command. For example, the file `pop(x) = 103*exp(x/10) plot "< awk '{ print $1-$2}'>` would plot the same information as the first popen command. Simple manipulations of this kind can also be used. Similarly, output can be piped to another application. For example, `set out "|lpr -Pmy_laser_printer"`

## Plot Data Using

The format of data within a file can be selected with the **using** option. An explicit scanf string can be used, or simpler column choices can be made.

```

plot "datafile"
{ using {<ycol> |
<xcol>:<ycol> |
<xcol>:<ycol>:<ydelta> |
<xcol>:<ycol>:<width> |
<xcol>:<ycol>:<xdelta> |
<xcol>:<ycol>:<ylo>:<yhi> |
<xcol>:<ycol>:<xlo>:<xhi> |
<xcol>:<ycol>:<xdelta>:<ydelta> |
<xcol>:<ycol>:<ydelta>:<width> |
<xcol>:<ycol>:<ylo>:<yhi>:<width> |
<xc>:<yc>:<xlo>:<xhi>:<ylo>:<yhi>}
{"<scanf string>"}...

splot "datafile"
{ using {<xcol>:<ycol>:<zcol>}
{"<scanf string> "}}...

```

<xcol>, <ycol>, and <zcol> explicitly select the columns to plot from a space or tab separated multicolumn data file. If only <ycol> is selected for **plot**, <xcol> defaults to 1. If only <zcol> is selected for **splot**, then only that column is read from the file. An <xcol> of 0 forces <ycol> to be plotted versus its coordinate number. <xcol>, <ycol>, and <zcol> can be entered as constants or expressions. Expressions enclosed in parentheses can be used to compute a column data value from all numbers in the input record.

If errorbars (see also **plot errorbars**) are used for **plots**, `xdelta` or `ydelta` (for example, a  $\pm$ -error) should be provided as the third column, or `(x,y)low` and `(x,y)high` as third and fourth columns. These columns must follow the `x` and `y` columns. If errorbars in both directions are wanted then `xdelta` and `ydelta` should be in the third and fourth columns, respectively, or `xlow`, `xhigh`, `ylo`, `yhigh` should be in the third, fourth, fifth, and sixth columns, respectively.

Scanf strings override any `<xcol>:<ycol>(:<zcol>)` choices, except for ordering of input, e.g.,

```
plot "datafile" using 2:1 "%f%*f%f"
```

causes the first column to be y and the third column to be x.

If the `scanf` string is omitted, the default is generated based on the `<xcol>`:`<ycol>`:(`<zcol>`) choices. If the **using** option is omitted, `"%f%f"` is used for **plot** (`"%f%f%f%f"` or `"%f%f%f%f%f%f"` for **errorbar plots**) and `"%f%f%f"` is used for **spplot**.

[illegible]

Data are read from the file “MyData” using the format “%\*f%f%\*20[^\n]f”. The meaning of this format is: “%\*f” ignore the first number, “%f” then read in the second and assign to x, “%\*20[^\n]” then ignore 20 non-newline characters, “%f” then read in the y value.

## Plot With Errorbars

Error bars are supported for 2-d data file plots by `rxdelta`, `rydelta`, `ylow` and `yhigh`, `xdelta`, `xlow` and `xhigh`, `xdelta` and `xdelta2`, respectively. No support exists for error bars for `scatter`.

In the default situation, gnuplot expects to see the coordinates either (x, y, ydelta), (x, y, ylow, yhigh), (x, y, xdelta, ydelta) or (x, y, xlow, xhigh, ylow, yhigh). The x coordinates must be exactly as given above. Data files in this

plot "data.dat" with errorbars (or yerrorbars)

plot "data.dat" with xerrorbars

plot "data.dat" with xyerrorbars

The error bar is a line plotted from (x, ylow) to (x, yhigh) specified instead of ylow and yhigh, ylow=y-ydelta and yhigh=y+ydelta for xlow and xhigh are derived similarly from xdelta. yhigh and ylow are both set to y and xhigh and xlow are both set to x between the data points, **plot** the data file twice,

If x or y autoscaling is on, the x or y range will be

Boxes may be drawn with y error bars using the `boxplot` command. The boxes may be either set with the "set boxwidth" command, or they may be drawn automatically so each box touches the adjacent box. The boxes may be drawn for the `xyerrorbars` style by using the `boxplot` command.

x,y,ylow & yhigh from columns 1,2,3,4

x from third, y from second, xdelta from 6	p
x,y,xdelta & ydelta from columns 1,2,3,4	p

## Plot Ranges

The optional range specifies the region of the plot

Ranges may be provided on the **plot** and **splot** commands using **set xrange**, **set yrange**, etc., commands, to change the range of the plot.

$$[\{<\text{dummy-var}>=\}\{<\text{xmin}>:<\text{xmax}>\}]$$

where <dummy-var> is the independent variable changed with **set dummy**) and the min and max

Both the min and max terms are optional. The ':' is specified. This allows '[' to be used as a null r

Specifying a range in the **plot** command line turns one of the **set** range commands turns autoscaling later. (See **set autoscale**).

This uses the current ranges

This sets the x range only

This sets both the x and y ranges

sets only y range, &

turns off autoscaling on both axes

This sets xmax and ymin only

This sets the x, y, and z ranges

## Plot With Style

Plots may be displayed in one of twelve styles: **lines**, **points**, **linespoints**, **impulses**, **dots**, **steps**, **errorbars** (or **yerrorbars**), **xerrorbars**, **xyerrorbars**, **boxes**, **boxerrorbars**, or **boxxyerrorbars**. The **lines** style connects adjacent points with lines. The **points** style displays a small symbol at each point. The **linespoints** style does both **lines** and **points**. The **impulses** style displays a vertical line from the x axis (or from the grid base for **splot**) to each point. The **dots** style plots a tiny dot at each point; this is useful for scatter plots with many points. The **steps** style is used for drawing staircase-like functions. The **boxes** style may be used for barcharts.

The **errorbars** style is only relevant to 2-d data file plotting. It is treated like **points** for **splots** and function **plots**. For data **plots**, **errorbars** is like **points**, except that a vertical error bar is also drawn: for each point (x,y), a line is drawn from (x,y<sub>low</sub>) to (x,y<sub>high</sub>). A tic mark is placed at the ends of the error bar. The y<sub>low</sub> and y<sub>high</sub> values are read from the data file's columns, as specified with the **using** option to plot. The **xerrorbars** style is similar except that it draws a horizontal error bar from x<sub>low</sub> to x<sub>high</sub>. The **xyerrorbars** or **boxxyerrorbars** style is used for data with errors in both x and y. A barchart style may be used in conjunction with y error bars through the use of **boxerrorbars**. See **plot errorbars** for more information.

Default styles are chosen with the **set function style** and **set data style** commands.

By default, each function and data file will use a different line type and point type, up to the maximum number of available types. All terminal drivers support at least six different point types, and re-use them, in order, if more than six are required. The LaTeX driver supplies an additional six point types (all variants of a circle), and thus will only repeat after twelve curves are plotted with points.

If desired, the style and (optionally) the line type and point type used for a curve can be specified.

with <style> {<linetype> {<pointtype>}}

where <style> is either **lines**, **points**, **linespoints**, **impulses**, **dots**, **steps**, **errorbars** (or **yerrorbars**), **xerrorbars**, **xyerrorbars**, **boxes**, **boxerrorbars**, **boxxyerrorbars**.

The <linetype> & <pointtype> are positive integer constants or expressions and specify the line type and point type to be used for the plot. Line type 1 is the first line type used by default, line type 2 is the second line type used by default, etc.

plots sin(x) with impulses	plot sin(x) with impulses
plots x*y with points, x**2 + y**2 default	splot x*y w points, x**2 + y**2
plots tan(x) with default function style	plot [ ] [-2:5] tan(x)
plots "data.1" with lines	plot "data.1" with l
plots "leastsq.dat" with impulses	plot 'leastsq.dat' w i
plots "exper.dat" with errorbars & lines connecting points	plot 'exper.dat' w l, 'exper.dat' w err

Here 'exper.dat' should have three or four data columns.

plots x**2 + y**2 and x**2 - y**2 with the same line type	splot x**2 + y**2 w l 1, x**2 - y**2 w l 1
plots sin(x) and cos(x) with linespoints, using the same line type but different point types	plot sin(x) w linesp 1 3, \ cos(x) w linesp 1 4
plots file "data" with points style 3	plot "data" with points 1 3

Note that the line style must be specified when specifying the point style, even when it is irrelevant. Here the line style is 1 and the point style is 3, and the line style is irrelevant.

See **set style** to change the default styles.

## Plot Title

A title of each plot appears in the key. By default the title is placed on the plot command line. The title can be changed with the **title** option. The title can be changed by preceding any **with** option.

title "<title>"

where <title> is the new title of the plot and must be shown in the key.

plots y=x with the title 'x'

plots the "glass.dat" file

with the title 'revolution surface'

plots x squared with title "x^2" and "data.1"

with title 'measured data'

## Set-Show Commands

All commands below begin with either **set** or **unset**, and usually their state can be shown by passing their name to the **show** command.

unit any angles are given in  
arrows from point to

force autoscaling of an axis  
enter/exit parametric mode  
display border  
clip points/line near boundaries  
specify parameters for contour plots  
enable plot contour plots  
default plotting style for data  
specify dummy variable  
tic-mark label format specification  
function plotting style  
draw a grid at tick positions  
enables hiddenline removal  
specify number of isolines  
enables key of curves in plot  
logscaling of axes (optionally giving base)  
mapping 3D coordinates  
offsets from center of graph  
color-mapped plotting modes  
mapping 2D coordinates  
set radial range  
set sampling rate of functions  
set scaling factors of plot  
control display of isolines of surface  
control graphics device  
change direction of tics  
adjust relative height of vertical axis  
adjust size of tick marks  
turn on time/date stamp  
set centered plot title  
set parametric range  
set surface parametric ranges  
sets the view point for **splot**  
sets the top view (map) for **splot**  
sets x-axis label  
set horizontal range  
change horizontal tics

adjust number of minor tick marks  
draw x-axis  
sets y-axis label  
set vertical range  
change vertical tics

draw y-axis  
set default threshold for values near 0  
draw axes  
sets z-axis label  
set vertical range  
change vertical tics

draw z-axis

```
angles [degrees|radians]
arrow [<tag>] [from <sx>,<sy>,<sz>]
    [to <ex>,<ey>,<ez>] [head|nohead|heads]
autoscale [<axes>]
parametric
border [<choice>] [<style>]
clip <clip-type>
cntrparam [spline] [points] [order] [levels]
contour [base|surface|both]
data style <style-choice>
dummy <dummy1>,<dummy2>...
format [<axes>] ["format-string"]
function style <style-choice>
grid [<which tics>...] [<linestyle>]
hidden3d [...]
isosamples <n1>[,<n2>]
key [...]
logscale <axes> [<base>]
mapping [cartesian|spherical|cylindrical]
offsets <left>,<right>,<top>,<bottom>
pm3d [...]
polar
rrange [<rmin>:<rmax>]
samples <expression>
size <xsize>,<ysize>
surface
terminal <device>
tics <direction>
ticslevel <level>
ticscale [<size>]
time
title "title-text" <xoff>,<yoff>
trange [<tmin>:<tmax>]
urange or vrange
view <rot_x>,<rot_z>,<scale>,<scale_z>
view map
xlabel "<label>" <xoff>,<yoff>
xrange [<xmin>:<xmax>]
xtics <start>,<incr>,<end>,<pos>
mxtics OR mytics [<freq>]
xzeroaxis
ylabel "<label>" <xoff>,<yoff>
yrange [<ymin>:<ymax>]
ytics <start>,<incr>,<end>,<pos>
yzeroaxis
zero <expression>
zeroaxis
zlabel "<label>" <xoff>,<yoff>
zrange [<zmin>:<zmax>]
ztics <start>,<incr>,<end>,<pos>
zzeroaxis
```

## Contour Plots

Enable contour drawing for surfaces. This option

Syntax: set contour { base | surface | both } unse

If no option is provided to **set contour**, the def  
to draw the contours: **base** draws the contours  
**surface** draws the contours on the surfaces thems  
base and the surface.

See also **set cntrparam** for the parameters that

## Contour Parameters

Sets the different parameters for the contouring p

set cntrparam

5 automatic levels  
3 discrete levels at 10%, 37% and 90%  
5 incremental levels at 0, .1, .2, .3 and .4  
sets n = 10 retaining current setting of auto, s  
incr., or discr.  
set start = 100 and increment = 50, retaining s  
old n

This command controls the way contours are plo  
pression and <z1>, <z2> any constant expressi

**linear**, **cubicspline**, **bspline** - Controls type of  
the contours are drawn piecewise linear, as extra  
then piecewise linear contours are interpolated to  
may undulate. The third option is the uniform b  
linear data but is guaranteed to be smoother.

**points** - Eventually all drawings are done with  
the number of points used to approximate a curve  
only.

**order** - Order of the bspline approximation to be  
resulting contour. (Of course, higher order bspline  
piecewise linear data.) This option is relevant for  
in the range from 2 (linear) to 10.

**levels** - Number of contour levels, 'n'. Selection  
'discrete', and 'incremental'. For 'auto', if the surf  
will be generated from zmin+dz to zmax-dz in  
(levels + 1). For 'discrete', contours will be genera  
discrete levels is limited to MAX\_DISCRETE\_LEV  
contours are generated at <n> values of z beginni

## Specifying Labels

Arbitrary labels can be placed on the plot using the **set label** command. If the z coordinate is given on a **plot** it is ignored; if it is missing on a **splot** it is assumed to be 0.

```
set label {<tag>}{ " <label text> " }      {at <x>, <y> {, <z> }}
                                             {<justification>}

unset label {<tag>}
show label
```

The text defaults to "", and the position to 0,0,0. The <x>, <y>, and <z> values are in the graph's coordinate system. The tag is an integer that is used to identify the label. If no <tag> is given, the lowest unused tag value is assigned automatically. The tag can be used to delete or change a specific label. To change any attribute of an existing label, use the **set label** command with the appropriate tag, and specify the parts of the label to be changed.

By default, the text is placed flush left against the point x,y,z. To adjust the way the label is positioned with respect to the point x,y,z, add the parameter <justification>, which may be **left**, **right** or **center**, indicating that the point is to be at the left, right or center of the text. Labels outside the plotted boundaries are permitted but may interfere with axes labels or other text.

```
label at (1,2) to "y=x"          set label "y=x" at 1,2
label "y=x`2" w right of the text at (2,3,4), set label 3 "y=x`2" at 2,3,4 right
& tag the label number 3
change preceding label to center justification set label 3 center
delete label number 2             unset label 2
delete all labels                 unset label
show all labels (in tag order)    show label
```

(The EEPIC, Imagen, LaTeX, and TPIC drivers allow \ in a string to specify a newline.)

## Miscellaneous Commands

For further information on these commands, print out a copy of the gnuplot manual.

```
change working directory      cd
erase current screen or device clear
exit gnuplot                  exit or quit or EOF
display text and wait         pause <time> ["<string>"]
print the value of <expression> print <expression>
print working directory       pwd
repeat last plot or splot      replot
spawn an interactive shell    ! (UNIX) or $ (VMS)
```

## Environment Variables

A number of shell environment variables are undefined but may be useful. See 'help environment' for the details.

If GNUTERM is defined, it is used as the name of the terminal type sensed by gnuplot on start up, but is not used in the start-up file (see **start-up**), and of course by later commands.

On Unix, OS/2, AmigaOS, and MS-DOS, GNUHELP is used as the name of the help file (gnuplot.gih).

On VMS, the symbol GNUPLOT\$HELP should be used as the name of the help file.

On Unix, HOME is used as the name of a directory in the current directory. On OS/2, AmigaOS and MS-DOS, the HOME environment variable in the gnuplot.ini file. On VMS, SYS\$LOGIN: is used as the name of the home directory.

GNUPLOT\_LIB may be used to define additional libraries to be loaded.

On Unix, PAGER is used as an output filter for the terminal output.

GDFONTPATH is the directory where png termin fonts are located. GNUPLOT\_FONTPATH is that for the postscript fonts.

On Unix and AmigaOS, SHELL is used for the shell command. On VMS, the command is used for the shell command.

On AmigaOS, GNUFONT is used for the screen font. On MS-DOS, the font file is phire/14".

On MS-DOS, if the BGI interface is used, the variable BGI\_PATH is the path to the BGI drivers directory. Furthermore SVGA is the name of the SVGA card, 800x600 res., and its mode of operation as 'Name. For example, C:\TC\BGI\SVGADRV.BGI and mode 3 is used as 'set SVGA=SVGADRV.3'.

GNUFITLOG holds the name of a directory or a file to which the fit log is written.

## Expressions

In general, any mathematical expression accepted by the C preprocessor is accepted. The precedence of these operators is determined by the C preprocessor. White space (spaces and tabs) is ignored.

Complex constants may be expressed as {<real>+<imag>}. Numerical constants may be numerical constants. For example, {3,2} represents a complex number. Curly braces are explicitly required here.

## Functions

The functions in gnuplot are the same as the corresponding functions in the Unix math library, except that all functions accept integer, real, and complex arguments, unless otherwise noted. The **sgn** function is also supported, as in BASIC.

Function	Arguments	Returns
abs(x)	any	absolute value of $x$ , $ x $ ; same type
abs(x)	complex	length of $x$ , $\sqrt{\text{real}(x)^2 + \text{imag}(x)^2}$
acos(x)	any	$\cos^{-1}x$ (inverse cosine) in radians
arg(x)	complex	the phase of $x$ in radians
asin(x)	any	$\sin^{-1}x$ (inverse sin) in radians
atan(x)	any	$\tan^{-1}x$ (inverse tangent) in radians
besj0(x)	radians	$J_0$ Bessel function of $x$
besj1(x)	radians	$J_1$ Bessel function of $x$
besy0(x)	radians	$Y_0$ Bessel function of $x$
besy1(x)	radians	$Y_1$ Bessel function of $x$
ceil(x)	any	$\lceil x \rceil$ , smallest integer not less than $x$ (real part)
cos(x)	radians	$\cos x$ , cosine of $x$
cosh(x)	radians	$\cosh x$ , hyperbolic cosine of $x$
erf(x)	any	$\text{Erf}(\text{real}(x))$ , error function of $\text{real}(x)$
erfc(x)	any	$\text{Erfc}(\text{real}(x))$ , $1.0 - \text{error function of } \text{real}(x)$
exp(x)	any	$e^x$ , exponential function of $x$
floor(x)	any	$\lfloor x \rfloor$ , largest integer not greater than $x$ (real part)
gamma(x)	any	$\Gamma(\text{real}(x))$ , gamma function of $\text{real}(x)$
ibeta(p,q,x)	any	$\text{Ibeta}(\text{real}(p, q, x))$ , ibeta function of $\text{real}(p, q, x)$
igamma(a,x)	any	$\text{Igamma}(\text{real}(a, x))$ , igamma function of $\text{real}(a, x)$
imag(x)	complex	imaginary part of $x$ as a real number
int(x)	real	integer part of $x$ , truncated toward zero
lgamma(x)	any	$\text{Lgamma}(\text{real}(x))$ , lgamma function of $\text{real}(x)$
log(x)	any	$\log_e x$ , natural logarithm (base $e$ ) of $x$
log10(x)	any	$\log_{10} x$ , logarithm (base 10) of $x$
rand(x)	any	$\text{Rand}(\text{real}(x))$ , pseudo random number generator
real(x)	any	real part of $x$
sgn(x)	any	1 if $x > 0$ , -1 if $x < 0$ , 0 if $x = 0$ . $\text{imag}(x)$ ignored
sin(x)	radians	$\sin x$ , sine of $x$
sinh(x)	radians	$\sinh x$ , hyperbolic sine $x$
sqrt(x)	any	$\sqrt{x}$ , square root of $x$
tan(x)	radians	$\tan x$ , tangent of $x$
tanh(x)	radians	$\tanh x$ , hyperbolic tangent of $x$

## Operators

The operators in gnuplot are the same as the corresponding operators in the C programming language, except that all operators accept integer, real, and complex arguments, unless otherwise noted. The **\*\*** operator (exponentiation) is supported, as in FORTRAN.

Parentheses may be used to change order of evaluation.