

gnuplot Quick Reference

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

Starting gnuplot

to enter gnuplot	<code>gnuplot</code>
to enter batch gnuplot	<code>gnuplot macro_file</code>
to pipe commands to gnuplot	<code>application gnuplot</code>

see below for environment variables you might want to change before entering gnuplot.

Exiting gnuplot

exit gnuplot	<code>quit</code>
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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	<code>help plot</code>
help on a topic	<code>help <topic></code>
list of all help available	<code>help or ?</code>
show current environment	<code>show all</code>

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 `terminal` 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 display terminal	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

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**.

```
plot "MyData" using "%*f%f%*20[^\n]%f" w lines
```

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 `rdelta`, `ydelta`, `ylo` and `yhigh`, `xdelta`, `xlo` and `xhigh`, `xdelta`, `xlo` and `xhigh`, `xdelta`, `xlo` and `xhigh`, respectively. No support exists for error bars for `scatter`.

In the default situation, gnuplot expects to see the coordinates of each data point either (x, y, ydelta), (x, y, ylow, yhigh), (x, y, xdelta, ydelta), (x, y, xlow, xhigh, ylow, yhigh) 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, $y_{low}=y-y_{delta}$ 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_{low}) to (x,y_{high}). A tic mark is placed at the ends of the error bar. The y_{low} and y_{high} 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_{low} to x_{high}. 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 with the **with** option.

title "<title>"

where <title> is the new title of the plot and must be placed on the plot command line. The title can be changed with the **with** option.

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.

[illegible]

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

The text defaults to "", and the position to 0,0,0. The $\langle x \rangle$, $\langle y \rangle$, and $\langle z \rangle$ values are in the graph's coordinate system. The tag is an integer that is used to identify the label. If no $\langle \text{tag} \rangle$ 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 undocumented but may be useful. See 'help environment' for the

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

On Unix, OS/2, AmigaOS, and MS-DOS, GNUH.
HELP file (gnuplot.gih).

On VMS, the symbol GNUPLOT\$HELP should
gnuplot.

On Unix, HOME is used as the name of a directory in the current directory. On OS/2, AmigaOS and VMS, the name of the user's home directory is in the gnuplot.ini file. On VMS, SYS\$LOGIN: is used. See the gnuplot manual for more details.

GNUPLOT_LIB may be used to define additional source files.

On Unix, PAGER is used as an output filter for h

GDFONTPATH is the directory where png termin
GNUPLOT_FONTPATH is that for the postscript

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

On AmigaOS, GNUFONT is used for the screen
phire/14".

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

GNUFITLOG holds the name of a directory or a

Expressions

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

Complex constants may be expressed as $\{<\text{real}>$
be numerical constants. For example, $\{3, 2\}$ repre
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.