

# Gnuplot FAQ

This document deals with **gnuplot** version 4.4 which is the latest official release as of March 2010.  
Its version is \$Revision: 1.41 \$, dated \$Date: 2010/04/19 21:01:47 \$.

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## 0 Meta – Questions

### 0.1 Where do I get this document?

The newest version of this document is on the web at [www.gnuplot.info/faq/](http://www.gnuplot.info/faq/).

This document was/is posted sometimes to the newsgroups `comp.graphics.apps.gnuplot`.

### 0.2 Where do I send comments about this document?

Send comments, suggestions etc via email to the developer mailing list `gnuplot-beta@lists.sourceforge.net`. Please contribute your suggestions with respect to the file `faq.tex` available from `gnuplot.cvs.sourceforge.net/viewvc/gnuplot/faq/`.

## 1 General Information

### 1.1 What is gnuplot?

**gnuplot** is a command-driven interactive function plotting program. It can be used to plot functions and data points in both two- and three-dimensional plots in many different formats. It is designed primarily for the visual display of scientific data. **gnuplot** is copyrighted, but freely distributable; you don't have to pay for it.

### 1.2 How did it come about and why is it called gnuplot?

The authors of **gnuplot** are: Thomas Williams, Colin Kelley, Russell Lang, Dave Kotz, John Campbell, Gershon Elber, Alexander Woo and many others.

The following quote comes from Thomas Williams:

I was taking a differential equation class and Colin was taking Electromagnetics, we both thought it'd be helpful to visualize the mathematics behind them. We were both working as sys admin for an EE VLSI lab, so we had the graphics terminals and the time to do some coding. The posting was better received than we expected, and prompted us to add some, albeit lame, support for file data.

Any reference to GNUplot is incorrect. The real name of the program is "**gnuplot**". You see people use "**Gnuplot**" quite a bit because many of us have an aversion to starting a sentence with a lower case letter, even in the case of proper nouns and titles. **gnuplot** is not related to the GNU project or the FSF in any but the most peripheral sense. Our software was designed completely independently and the name "**gnuplot**" was actually a compromise. I wanted to call it "llamaplot" and Colin wanted to call it "nplot." We agreed that "newplot" was acceptable but, we then discovered that there was an absolutely ghastly pascal program of that name that the Computer Science Dept. occasionally used. I decided that "**gnuplot**" would make a nice pun and after a fashion Colin agreed.

### 1.3 What does gnuplot offer?

- Plotting two-dimensional functions and data points in many different styles (points, lines, error bars)
- Plotting three-dimensional data points and surfaces in many different styles (contour plot, mesh)
- Algebraic computation in integer, float and complex arithmetic
- User-defined functions and hot-keys

- Support for a large number of operating systems, graphics file formats and output devices
- Extensive on-line help
- T<sub>E</sub>X-like text formatting for labels, titles, axes, data points
- Interactive command line editing and history (most platforms)

#### 1.4 Is gnuplot suitable for scripting?

Yes. Gnuplot can read in files containing additional commands during an interactive session, or it can be run in batch mode by piping a pre-existing file or a stream of commands to stdin. Gnuplot is used as a back-end graphics driver by such higher-level mathematical packages as Octave, and can easily be wrapped in a cgi script for use as a web-driven plot generator.

#### 1.5 Can I run gnuplot on my computer?

**Gnuplot** is in widespread use on many platforms, including MS Windows, linux, unix, and OSX. The current source code retains supports for older systems as well, including VMS, Ultrix, OS/2, MS-DOS, BeOS, and Macintosh. Versions since 4.0 have not been extensively tested on legacy platforms.

Please notify the FAQ-maintainer of any further ports you might be aware of.

You should be able to compile the **gnuplot** source more or less out of the box on any reasonable standard (ANSI/ISO C, POSIX) environment.

#### 1.6 Legalities

**Gnuplot** is freeware authored by a collection of volunteers, who cannot make any legal statement about the compliance or non-compliance of **gnuplot** or its uses. There is also no warranty whatsoever. Use at your own risk.

Citing from the README of a mathematical subroutine package by R. Freund:

For all intent and purpose, any description of what the codes are doing should be construed as being a note of what we thought the codes did on our machine on a particular Tuesday of last year. If you're really lucky, they might do the same for you someday. Then again, do you really feel \*that\* lucky?

#### 1.7 Does gnuplot have anything to do with the FSF and the GNU project?

**Gnuplot** is neither written nor maintained by the FSF. It is not covered by the General Public License, either. It used to be distributed by the FSF, however, due to licensing issues it is no longer.

**Gnuplot** is freeware in the sense that you don't have to pay for it. However it is not freeware in the sense that you would be allowed to distribute a modified version of your **gnuplot** freely. Please read and accept the Copyright file in your distribution.

#### 1.8 Where do I get further information?

See the main gnuplot web page [www.gnuplot.info](http://www.gnuplot.info) and references therein, mainly gnuplot links [gnuplot.sourceforge.net/links.html](http://gnuplot.sourceforge.net/links.html).

Some documentation and tutorials are available in other languages than English. See [gnuplot.sourceforge.net/help.html](http://gnuplot.sourceforge.net/help.html), section "Localized learning pages about gnuplot", for the most up-to-date list.

## 2 Setting it up

### 2.1 What is the current version of gnuplot?

The current released version of **gnuplot** is 4.4 (March 2010). The current patchlevel is 4.4.2 (September 2010).

## 2.2 Where can I get gnuplot?

The best place to start is `www.gnuplot.info`. From there you find various pointers to other sites, including the project development site on SourceForge `sourceforge.net/projects/gnuplot`.

The source distribution ("gnuplot-4.4.0.tar.gz" or a similar name) is available from the official distribution site `sourceforge.net/projects/gnuplot`.

Older versions of the **gnuplot** distribution are mirrored at the Comprehensive TeX Archive Network (CTAN) in the `graphics/gnuplot` directory. See

- `www.ctan.org/`.

## 2.3 Where can I get current development version of gnuplot?

The development version of gnuplot is available as a cvs source tree online for direct browsing from `sourceforge.net/projects/gnuplot`, section "CVS". You can download all current sources according to the documentation therein; for example by a sequence of commands like

```
cvs -d:pserver:anonymous@gnuplot.cvs.sourceforge.net:/cvsroot/gnuplot login
cvs -z3 -d:pserver:anonymous@gnuplot.cvs.sourceforge.net:/cvsroot/gnuplot co -P
```

or (in bash)

```
export CVSROOT=:pserver:anonymous@gnuplot.cvs.sourceforge.net:/cvsroot/gnuplot
cvs login
cvs -z3 checkout gnuplot
```

Hit `<return>` when asked for a password.

Further, before the `./configure` command of gnuplot compilation phase, you have to execute `./prepare` to create the up-to-date configure files.

There are no official preliminary binary releases of gnuplot: you have to compile it yourself. However, you may find unofficial binary releases for some platforms, like OS/2, Windows or Macintosh.

Important note: questions related to the development version should go to `gnuplot-beta@lists.sourceforge.net`.

## 2.4 How do I get gnuplot to compile on my system?

As you would any other installation. Read the files `README.1ST` and `README`.

- For Unix, use `./configure` (or `./configure --prefix=$HOME/usr` for an installation for a single user), make and finally make `install` or `make install-strip`, the latter for smaller executables without debugging information. If you want to make a RPM package, then replace the latest step by `checkinstall` or `checkinstall make install-strip`, supposing the package `checkinstall` on your machine.
- For DOS, if you are using bash and DJGPP, you can just run `djconfig.sh`.
- For other platforms, copy the relevant makefile (e.g. `makefile.os2` for OS/2, or `makefile.mgw` or `makefile.cyg` for Windows) from `config/` to `src/`, optionally update options in the makefile's header, then change directory to `src` and run `make`.

## 2.5 What documentation is there, and how do I get it?

The documentation is included in the source distribution. Look at the `docs` subdirectory, where you'll find

- a PDF version of the user manual
- a Unix man page, which says how to start **gnuplot**
- a help file, which also can be printed as a manual

- a tutorial on using **gnuplot** with  $\text{\LaTeX}$
- a quick reference summary sheet for  $\text{\TeX}$  only

The documentation is built during installation if you have  $\text{\LaTeX}$  installed on your system, look in the directories `docs` and `tutorial`. `make pdf` in the `docs` subdirectory will make a `gnuplot.pdf` hypertext file ready for browsing or printing.

Online gnuplot documentation is available at `gnuplot.sourceforge.net/documentation.html`.

## 2.6 Worked examples

There is a directory of worked examples in the the source distribution. These examples, and the resulting plots, may also be found at `gnuplot.sourceforge.net/demo/`.

## 2.7 How do I modify gnuplot, and apply 'patches'?

For this, you will need to recompile **gnuplot**.

Modifications people make are either done by replacing files, such as terminal drivers, or by 'patching'. If a file is a replacement, it will probably tell you in its README or in the lines at the beginning.

To patch a file, you need the `patch` utility, and possibly also `automake` and `autoconf`. On many UNIX systems these will already be installed; If they aren't, you can find them wherever GNU software is archived. Typical command for applying a patch is `patch -p0 <newfunctionality.diff`.

There is repository of contributed patches in the "Patches" section on gnuplot's sourceforge site `gnuplot.sourceforge.net`.

## 3 Working with it.

### 3.1 How do I get help?

Read this document.

Give the `help` command at the initial prompt. After that, keep looking through the keywords. Good starting points are `plot` and `set`.

Read the manual, if you have it.

Look through the demo subdirectory; it should give you some ideas.

Ask your colleagues, the system administrator or the person who set up **gnuplot**.

If all these fail, please upgrade to the newest version of **gnuplot** or urge your system-administrator to do so. Then post a question to `comp.graphics.apps.gnuplot` or send mail to the gatewayed mailing list `gnuplot-info@lists.sourceforge.net`. Do not forget to cite the version number and the operating system. If you want to subscribe to the mailing list, visit the URL `lists.sourceforge.net/lists/listinfo/gnuplot-info`. But please don't use the mailing list if you can read `comp.graphics.apps.gnuplot` directly. If you post a question there, it is considered good form to solicit e-mail replies and post a summary.

### 3.2 How do I print out my graphs?

The kind of output produced is determined by the `set terminal` command; for example, `set terminal postscript` will produce the graph in PostScript format. Output can be redirected using the `set output` command.

As an example, the following prints out a graph of  $\sin(x)$  on a Unix machine running the X-Window System.

```
gnuplot> plot [-6:6] sin(x)
gnuplot> set terminal postscript
Terminal type set to 'postscript'
Options are 'landscape monochrome "Courier" 14'
gnuplot> set output "sin.ps"
gnuplot> replot
```

```

gnuplot> set output                # set output back to default
gnuplot> set terminal x11          # ditto for terminal type
gnuplot> ! lp -ops sin.ps          # print PS File (site dependent)
request id is lprint-3433 (standard input)
lp: printed file sin.ps on fg20.rz.uni-karlsruhe.de (5068 Byte)
!
gnuplot>

```

Using the platform-independent way of restoring terminal by `set term push/pop` commands, do it by

```

gnuplot> set terminal postscript eps color lw 15 "Helvetica" 20
gnuplot> set out 'a.eps'
gnuplot> replot
gnuplot> set term pop

```

The command `set term pop` without a previous corresponding `set term push` switches the terminal back to the startup terminal, e.g. `x11`, `pm` or `win`.

In MS Windows you can click in the upper left corner of the graph window and print directly from there.

### 3.3 How do I include my graphs in <word processor>?

Basically, you save your plot to a file in a format your word processor can understand (using `set term` and `set output`, see above), and then you read in the plot from your word processor. Vector formats (PostScript, `emf`, `svg`, `pdf`, `TEX`, `LATEX`, etc) should be preferred, as you can scale your graph later to the right size.

Details depend on which word processor you use; use `set term` to get a list of available file formats.

Many word processors can use Encapsulated PostScript for graphs. This can be generated by the `set terminal postscript eps` command. Note that it is a good idea to check and correct the bounding box of the graphs in the eps files (manually or by the `fixbb` script from gnuplot webpage), as you have to correct this box for any eps figure produced by whichever program. Some (most?) word processors do not preview the actual image in the eps file, and you have to add the preview image yourself. You can use the GSView viewer for this (available for OS/2, Windows and X11), or some Unix `ps` tool. Note that the preview image increases size of the eps file; the smallest increase you may get by choosing Tiff 6 Packbits.

Some office Windows applications, also OpenOffice.org, can handle vector images produced by the `emf` terminal. OpenOffice.org can also read AutoCAD's `dxf` format, as well as SVG thanks to SVG Import Filter [www.ipd.uni-karlsruhe.de/~hauma/svg-import/](http://www.ipd.uni-karlsruhe.de/~hauma/svg-import/).

With `TEX`, it depends on what you use to print your dvi files. If you use `dvips` or `dvi2ps`, you can use Encapsulated PostScript. For `emTEX` (popular for OS/2 and MS-DOS), you can use `emTEX`, otherwise use the `LATEX` terminal type, which generates a picture environment. You can also use `epslatex` to separate the graphics and text parts. Other possibilities include `pslatex` or `pstex` terminals, and `metafont` or `metapost` terminals.

With `TEX` processed by `pdftex` or `pdflatex`, you can use `png`, `jpeg` and `pdf` terminal types. You can also use the `postscript eps` terminal and convert the eps file externally to pdf by `epstopdf`. Another choice is the `epslatex` terminal, after converting the eps part to pdf as above (the `TEX` part can remain unchanged). Gnuplot version 4.4 has a `tikz` terminal type that produces full text and graphics when the output is processed with `pdflatex`.

Most word processors can import bitmap images (`png`, `pbm`, etc). The disadvantage of this approach is that the resolution of your plot is limited by the size of the plot at the time it is generated by gnuplot, which is generally a much lower resolution than the document will eventually be printed in.

Under IBM OS/2, MacOS and Micro\$oft Windows you can use the clipboard to copy your graph and paste it into your favourite word processor.

The `mif` terminal type produces output for FrameMaker.

### 3.4 How do I edit or post-process a gnuplot graph?

This depends on the terminal type you use.

- X11 toolkits: You can use the terminal type `fig` and use the **xfig** drawing program to edit the plot afterwards. You can obtain the xfig program from its web site [www.xfig.org](http://www.xfig.org). More information about the text-format used for fig can be found in the fig-package.

You may use the `tgif` terminal, which creates output suitable for reading within `tgif` ([bourbon.cs.umd.edu:8001/tgif/](http://bourbon.cs.umd.edu:8001/tgif/)), an interactive 2-D drawing tool under X11.

- You may use the `svg` terminal (scalable vector graphics), which can be further edited by a `svg` editor, e.g. **Inkscape** ([www.inkscape.org](http://www.inkscape.org)), **Sketch** ([sketch.sourceforge.net](http://sketch.sourceforge.net)) or **Dia** ([www.lysator.liu.se/~alla/dia](http://www.lysator.liu.se/~alla/dia)), or loaded into **OpenOffice.org** with an on-fly conversion into OO.o Draw primitives.
- PostScript or PDF output can be edited directly by tools such as Adobe Illustrator or Acrobat, or can be converted to a variety of other editable vector formats by the **pstoedit** package. Pstoedit is available at [www.pstoedit.net](http://www.pstoedit.net).
- The `mif` terminal type produces an editable FrameMaker document.
- The DXF format is the AutoCAD's format, editable by several other applications.
- Bitmapped graphics (e.g. `png`, `jpeg`, `pbm`) can be edited using tools such as ImageMagick or Gimp. In general, you should use a vector graphics program to post-process vector graphic formats, and a pixel-based editing program to post-process pixel graphics.

### 3.5 How do I change symbol size, line thickness and the like?

Gnuplot offers a variety of commands to set line and point properties, including color, thickness, point shape, etc. The command `test` will display a test page for the currently selected terminal type showing the available pre-defined combinations of color, size, shape, etc. The `set style` command can be used to define additional combinations.

### 3.6 Can I animate my graphs?

First have a look at `animate.dem` in the demo directory of **gnuplot**. Basically, animated graphs are a sequence of plots in a suitable format.

If your installation of **gnuplot** is linked with `gd 2.0.29` or newer (see previous entry), the `gif` terminal can generate directly an animated GIF.

Otherwise, have a look at the tool `whirlgif 3.04`, available at [www.danbbs.dk/~dino/whirlgif](http://www.danbbs.dk/~dino/whirlgif). It reads run-length encoded GIF files and packs them into a minimal animation. On the web-pages you will find a manual and an example.

You can also write a small script to get **gnuplot** to output a family of GIF files, then have it execute some animator such as `gifsicle`: [www.lcdf.org/~eddielwo/gifsicle](http://www.lcdf.org/~eddielwo/gifsicle) or `gifmerge` [the-labs.com/GIFMerge](http://the-labs.com/GIFMerge).

`mpeg_encode` will encode a sequence of images into an `mpeg` format movie.

### 3.7 How do I plot implicit defined graphs?

Implicit graphs or curves cannot be plotted directly in **gnuplot**. However there is a workaround.

```
gnuplot> # An example. Place your definition in the following line:
gnuplot> f(x,y) = y - x**2 / tan(y)
gnuplot> set contour base
gnuplot> set cntrparam levels discrete 0.0
gnuplot> unset surface
gnuplot> set table 'curve.dat'
gnuplot> splot f(x,y)
gnuplot> unset table
gnuplot> plot 'curve.dat' w l
```



The trick is to draw the single contour line  $z=0$  of the surface  $z=f(x,y)$ , and store the resulting contour curve to a **gnuplot** datafile.

### 3.8 How to fill an area between two curves

A plot with filled area between two given curves requires a parametric plot with `filledcurves closed`. The example below demonstrates this for two curves  $f(x)$  and  $g(x)$  with a tricky "folded" parameter  $t$ :

```
set parametric
f(x)=cos(x)
g(x)=sin(x)
xmax=pi/4
set xrange [0:xmax]
set trange [0:2*xmax]
path(t) = ( t<= xmax ? f(t) : g(2*xmax-t) )
fold(t) = ( t <=xmax ? t : 2*xmax - t)
plot fold(t),path(t) with filledcurves closed
```

Note that the above code fills area between the two curves, not area satisfying inequality  $g(x)<f(x)$ . If you want the latter, you should use the ternary operator in `path(t)` to return an undefined value (0/0) if the inequality is not satisfied.

See the documentation for `help parametric`, `help filledcurves`, and `help ternary`.

### 3.9 Pm3d plot from a datafile does not draw anything

You do `set pm3d; splot 'a.dat'` and no plot but colorbox appears. Obviously, there is no blank line in between two subsequent scans (isolines) in the data file. Add blank lines! If you are curious what this means, then don't hesitate to look to files like `demo/glass.dat` or `demo/triangle.dat` in the `gnuplot demo` directory.

You can find useful the following `awk` script (call it e.g. `addblanks.awk`) which adds blank lines to a data file whenever number in the first column changes:

```
/^[[:blank:]]*#/ {next} # ignore comments (lines starting with #)
NF < 3 {next} # ignore lines which don't have at least 3 columns
$1 != prev {printf "\n"; prev=$1} # print blank line
{print} # print the line
```

Then, either preprocess your data file by command `awk -f addblanks.awk <a.dat` or plot the datafile under a unixish platform by `gnuplot> splot "<awk -f addblanks.awk a.dat"`.

### 3.10 Drawing a (color) map, i.e. 2D projection of 3D data

Use `set view map; unset surface` or `set pm3d map` rather than `set view 180,0`. The latter facilitates drawing matrices or data files as maps, even without the necessity for matrix-like data organization (gridding). It is possible to decrease the output postscript file size by postprocessing it by `pm3dCompress.awk` or `pm3dConvertToImage.awk`.

Note there is a new plotting style with `image` for plotting 2D color images with support for almost arbitrary text or binary files in "Patches" section on `gnuplot's` sourceforge site [www.sourceforge.net/projects/gnuplot/](http://www.sourceforge.net/projects/gnuplot/).

### 3.11 How to overlay dots/points scatter plot onto a pm3d map/surface

Use the explicit (see also implicit) switch of the `pm3d` style:

```
gnuplot> set pm3d explicit
gnuplot> splot x with pm3d, x*y with points
```

### 3.12 How to draw black contour plot, and contours with labels

Well, it is very simple even though it is hard to discover: `unset clabel`.

```
set contour both; set cntr levels 100
unset clabel
unset surface
splot x*y with line lt -1
pause -1
splot x*y with line palette
```

Another solution requires to write contours into a temporary file using `set table`.

```
set contour base; set cntrparam levels 15; unset surface; set view map
splot x*x+y*y; pause -1
set table 'contour.dat'
replot
unset table
```

Now, for drawing it in 2D, do

```
reset
plot 'contour.dat' with line -1
```

and for contours in 3D do

```
reset
# Change single blank lines to double blank lines
!awk "NF<2{printf"\n\n"}{print}" <contour.dat >contour1.dat
splot 'contour1.dat' with line -1
```

See also the following question "How to overlay contour plot over pm3d map/surface".

Labelling contours by their z-value can be achieved by a suitable script generating automatically the appropriate `set label` commands; you can find one at [gnuplot scripts page gnuplot.sourceforge.net/scripts/index.html#tricks-here](http://gnuplot.scripts.sourceforge.net/scripts/index.html#tricks-here).

### 3.13 How to overlay contour plot over pm3d map/surface

This requires you to write contours into a temporary file using the `table` terminal, and then use this file in the final drawing without `set contours`. The following example demonstrates this for a map; for surface, remove `set pm3d map` and put `set ticslevel 0`.

```
# Write contours of function x*x-y*y to a (temporary) file
set contour base; set cntrparam level 20
unset surface
set table 'contour.dat'
splot x*x-y*y
unset table

# Change single blank lines to double blank lines
!awk "NF<2{printf"\n\n"}{print}" <contour.dat >contour1.dat

# Draw the plot
reset
set palette gray
set palette gamma 2.5
set pm3d map
set pm3d explicit
splot x*x+y*y with pm3d, 'contour1.dat' with line lt -1
!rm contour.dat contour1.dat
```

The last command deletes the two temporary files.

### 3.14 Color facets with pm3d

It is possible to draw colors facets of a 3D objects, organized in such a file:

```
# triangle 1
x0 y0 z0 <c0>
x1 y1 z1 <c1>

x2 y2 z2 <c2>
x2 y2 z2 <c2>

# triangle 2
x y z
...
```

Notice the positioning single and double blank line. <c> is an optional color. Then plot it by (either of splot's):

```
set pm3d
set style data pm3d
splot 'facets.dat'
splot 'facets_with_color.dat' using 1:2:3:4
```

Note that you avoid surface lines by `set style data pm3d` or `splot ... with pm3d`.

In the above example, `pm3d` displays triangles as independent surfaces. They are plotted one surface after another, as found in the data file. Parts overlapping in 2D projection are overdrawn.

Gnuplot is not 3D modeling program. Its hidden routines apply for points and lines, but not for faces. Without handling the data as a collection of faces, there would be no surface anything could be hidden behind. The 'hidden3d' algorithm works by using the input data in two ways: first, to set up a collection of triangles (made from a mesh of quadrangles) that form the surface, second as a collection of edges. It then goes through all those edges, checking what parts of them are not hidden behind any faces, and draws those.

Consequently, gnuplot won't draw your surface or 3D object as a virtual reality. It works OK for `set pm3d map` but for true 3D you would be probably more happy writing a convertor of your facets into a VRML file.

### 3.15 Palette for printing my color map on color as well as black&white printer?

I think it is this one, for example: `set palette rgbformulae -25,-24,-32`. Can somebody prove this?

## 4 Wanted features

### 4.1 What's new in gnuplot 4.2, 4.4 etc?

Too many things to be named here. Please refer to the NEWS file in the source distribution, or the "New features" section in the gnuplot documentation.

### 4.2 Does gnuplot support a driver for <graphics format>?

To see a list of the available graphic drivers for your installation of **gnuplot**, type `set term`.

Some graphics drivers are included in the normal distribution, but are not built by default. If you want to use them, you'll have to change file `gnuplot/src/term.h`, and recompile.

### 4.3 Does gnuplot have hidden line removal?

Yes.

### 4.4 Does gnuplot support bar-charts/histograms/boxes?

Various clustered and stacked histogram styles are supported in **gnuplot** version 4.2 and later as separate style types.

### 4.5 Does gnuplot support pie charts?

It's not possible in **gnuplot**, but have a look at [www.usf.uni-osnabrueck.de/~breiter/tools/piechart/piecharts.en.html](http://www.usf.uni-osnabrueck.de/~breiter/tools/piechart/piecharts.en.html)

### 4.6 Does gnuplot quarterly time charts?

It's not possible in **gnuplot**, but have a look at [ricardo.ecn.wfu.edu/~cottrell/qplot](http://ricardo.ecn.wfu.edu/~cottrell/qplot). The corresponding file `qplot.zip` can be obtained from the contrib directory on any **gnuplot** server.

### 4.7 Can I put multiple pages on one page?

Yes. `set multiplot`.

If you use the postscript terminal and plot one graph per page you can use the program `mpage` ([www.mesa.nl/pub/mpage](http://www.mesa.nl/pub/mpage)) to print multiple logical pages per physical page. A similar program is the `psnup` program in the `psutils` package. This package is available at any CTAN mirror.

### 4.8 Does gnuplot support multiple y-axes on a single plot?

Yes. You can have 2 x- and 2 y-axes per plot. The additional axes are called `x2` and `y2`. See `help plot`.

### 4.9 Can I put both commands and data into a single file?

This is possible by the new `plot "-"` possibility. The `plot "-"` command allows to read the data to be plot from standard input or the current batch job.

```
gnuplot> plot "-"
1 1
2 4
3 9
e
```

### 4.10 Can I put Greek letters and super/subscripts into my labels?

Most terminal types (output device drivers) support an "enhanced text" mode. This lets you use sub- and superscripts. It also allows to use Greek letters and math symbols to the extent that these are supported by the fonts installed on your system.

You might try using the  $\LaTeX$  terminal type and putting text like `"\alpha_{3}"` or `'\alpha_{3}'`. If you include your **gnuplot**-graphs into a  $\LaTeX$  document you can use the  $\LaTeX$ -package `psfrag` to typeset any characters into your graphs.

One more possibility is to use the MetaPost terminal. It supports  $\TeX$  syntax and is converted onto encapsulated PostScript by `mpost`.

#### 4.11 How do I include accented characters

To obtain accented characters like ü or ñ in your labels you should use 8bit character codes together with the appropriate encoding option. See the following example:

```
gnuplot> set encoding iso_8859_1
gnuplot> set title "M\374nchner Bierverbrauch \374ber die Jahre"
gnuplot> plot "bier.dat" u 1:2
```

Consequently, you can type labels in Czech, French, Hungarian, Russian... by means of an appropriate `set encoding`. However, you cannot mix two encodings in one file (e.g. accents for west and east latin encodings).

A more general solution is to use UTF-8 encoded fonts, and type the UTF-8 characters directly into gnuplot. This works for many terminal types but not, unfortunately, PostScript. Update: Version 4.4 contains contains more complete support for UTF-8, including PostScript.

#### 4.12 Can I do 1:1 scaling of axes?

Use `set size square`.

#### 4.13 Can I put different text sizes into my plots?

Some terminals can, others can't. Some allow you to choose a font size for the entire plot. Terminals supporting the "enhanced text" mode allow you to change fonts and text sizes within a plot. Look at the help for these terminals.

#### 4.14 How do I skip data points?

By specifying `?` as a data value, as in

```
1 2
2 3
3 ?
4 5
```

See also `set missing`. See also `set datafile commentschars` for specifying comment characters in data files.

#### 4.15 How do I plot every nth point?

This can be specified with various options for the command `plot`, for example `plot 'a.dat' every 2`. If you want to draw a line through every point but only draw a point symbol at every nth point, then try `plot 'a.dat' with linespoints pointinterval n`.

#### 4.16 How do I plot a vertical line?

Depending on context, the main methods are:

- `set arrow .... nohead` where you have to compute explicitly the start and the end of the arrow.
- generate (inlined) datapoints and plot them
- switch to parametric mode

## 4.17 How do I plot data files

Easily: by a command `plot 'a.dat'`. In 3D, use `splot 'a.dat'` – but don't forget to put a blank line in between two subsequent scans (isolines), otherwise you will get an error that the data is not gridded; see also question 3.9. If your data are not gridded, then use `set dgrid3d {many options}`.

## 4.18 How do I replot multiplot drawing

You cannot directly: `gnuplot` supports `replot` command, not `remultiplot`. You have to write the complete sequence of commands since `set multiplot` till `unset multiplot` into a script file. Then you can load the script into `gnuplot` as many times as you need for replotting the drawing to different terminals or output files.

# 5 Miscellaneous

## 5.1 I've found a bug, what do I do?

First, try to see whether it actually is a bug, or whether it is a feature which may be turned off by some obscure `set`-command.

Next, see whether you have an old version of **gnuplot**; if you do, chances are the bug has been fixed in a newer release.

Fixes for bugs reported since the release of the current version are held in the `patches` directory at **gnuplot** distribution sites. Before submitting a bug report, please check whether the bug in question has already been fixed.

If, after checking these things, you still are convinced that there is a bug, proceed as follows. If you have a fairly general sort of bug report, posting to `comp.graphics.apps.gnuplot` is probably the way to go. If you have investigated a problem in detail, especially if you have a context or unified diff that fixes the problem, please e-mail a report to `gnuplot-bug@lists.sourceforge.net`.

The `bug-gnuplot` list is for reporting and collecting bug fixes, the `comp.graphics.apps.gnuplot` newsgroup will be more help for finding work arounds or actually solving **gnuplot** related problems. If you do send in a bug report, be sure and include the version of **gnuplot** (including `patchlevel`) as shown by the command `show version long`, terminal driver, operating system, an exact description of the bug and input which can reproduce the bug. Failure to indicate these details can render a solution to your problem almost impossible. Also, any context diffs should be referenced against the latest official version of **gnuplot** if at all possible.

## 5.2 Can I use gnuplot routines for my own programs?

On systems supporting pipes, you can pipe commands to **gnuplot** from other programs. Many applications with `gnuplot` as the graphics engine, like Octave ([www.octave.org](http://www.octave.org)), uses this method. This also works from a `cgi` script to drive **gnuplot** from a forms-based web page.

John Campbell ([jdc@nauvax.ucc.nau.edu](mailto:jdc@nauvax.ucc.nau.edu)) modified a much earlier version of **gnuplot** (3.5) to be a library of C subroutines callable from a C program. `Gnuplot` itself has changed radically since then, and we are not aware of any plans to create a similar library based on the current version.

## 5.3 What extensions have people made to gnuplot? Where can I get them?

Many extensions or patches are available on the "Patches" page of the `gnuplot` development site [sourceforge.net/tracker/?group\\_id=2055&atid=302055](http://sourceforge.net/tracker/?group_id=2055&atid=302055). The current development version will generally include some of these being debugged for inclusion in a later official release of `gnuplot`.

Older extensions, which may or may not work with the current version, are available from `ftp.ucc.ie` in `/pub/gnuplot/contrib/`.

Some extensions available:

- `date-errorbar`: allows dates in the `hi/lo` fields for errorbars.

- `perlTk`: A perl/tk canvas widget.
- `polyg.patch`: Implements a polygon plotting style.
- `xgfe`: graphical front end using the Qt widgets available at [www.tug.org/tex-archive/graphics/gnuplot/contrib/](http://www.tug.org/tex-archive/graphics/gnuplot/contrib/).
- `Gnuplot.py`: A python package to create graphs from within python. More information at [gnuplot-py.sourceforge.net](http://gnuplot-py.sourceforge.net).

## 5.4 I need an integration, fft, iir-filter,...!

**Gnuplot** has been and is a plotting program, not a data processing or mathematical program suite. Therefore **gnuplot** can't do that. Look into the demo file "bivariat.dem" for a basic implementation of an integration.

For more sophisticated data-processing read the next section.

## 5.5 Can I do heavy-duty data processing with gnuplot? or What is beyond gnuplot?

**gnuplot** alone is not suited very well for this. One thing you might try is `fudgit`, an interactive multi-purpose fitting program written by Martin-D. Lacasse ([isaac@frodo.physics.mcgill.ca](mailto:isaac@frodo.physics.mcgill.ca)). It can use **gnuplot** as its graphics back end and is available from [ftp.physics.mcgill.ca](ftp://physics.mcgill.ca/pub/Fudgit/fudgit_2.33.tar.Z) in `/pub/Fudgit/fudgit_2.33.tar.Z` and from the main Linux server, [tsx-11.mit.edu](http://tsx-11.mit.edu) and its numerous mirrors around the world as `/pub/linux/sources/usr.bin/fudgit-2.33.tar.z`. Versions are available for AIX, Data General, HP-UX, IRIX 4, Linux, NeXT, Sun3, Sun4, Ultrix, OS/2 and MS-DOS. The MS-DOS version is available on `sintel20` mirrors (`sintel20` itself has closed down) in the "math" subdirectory as `fudg_231.zip`.

Michael Courtney has written a program called `lsqrft`, which uses the Levenberg-Marquardt - algorithm for fitting data to a function. It is available from [hobbes.nmsu.edu](http://hobbes.nmsu.edu) in `/pub/os2/apps/analysis/lsqrft15.zip`; sources, which should compile on Unix, and executables for MS-DOS and OS/2 are available. There is an interface to the OS/2 presentation manager.

You might also want to look at the applications developed by the Software Tools Group (STG) at the National Center for Supercomputing Applications. Ftp to [ftp.ncsa.uiuc.edu](ftp://ncsa.uiuc.edu) and get the file `README.BROCHURE` for more information.

You can also try `pgperl`, an integration of the PGPLOT plotting package with Perl 5. Information can be found at [www.ast.cam.ac.uk/AAO/local/www/kgb/pgperl](http://www.ast.cam.ac.uk/AAO/local/www/kgb/pgperl), the source is available from [ftp.ast.cam.ac.uk](ftp://ast.cam.ac.uk) in `/pub/kgb/pgperl/` or [linux.nrao.edu](http://linux.nrao.edu) in `/pub/packages/pgperl/`.

Another possibility is **Octave**. To quote from its README: Octave is a high-level language, primarily intended for numerical computations. Octave is licensed under GPL, and in principle, it is a free Matlab clone. It provides a convenient command line interface for solving linear and nonlinear problems numerically. The latest released version of Octave is always available from [www.octave.org](http://www.octave.org). By the way, octave uses **gnuplot** as its plotting engine, so you get a data-processing program on top of **gnuplot**.

Finally, there is `scilab` at [www-rocq.inria.fr/scilab/](http://www-rocq.inria.fr/scilab/) doing about the same as matlab. It is free but copyrighted software.

## 5.6 Mouse in my interactive terminal does not work

If your mouse is not working, try to hit 'm' in the interactive terminal to switch mousing on/off. See below for the list of supported interactive terminals.

If it still does not run, then either `gnuplot` has not been configured or compiled with mouse support, or you have not properly installed it, or running an older version of `gnuplot` (check your `PATH`).

If your `gnuplot` is running as the plotting engine of Octave under X11, then please put `set mouse` into your `$HOME/.gnuplot` (preferred than putting `gset mouse` into `$HOME/.octaverc`). This is needed only for `gnuplot 4.0`: according to its `help x11_mouse`, `gnuplot 4.0` under x11 running through a pipe needs `set mouse` to be executed before launching the x11 plot window.

## 5.7 How to use hotkeys in my interactive terminals

There are several hotkeys available in interactive terminals. Currently the following interactive terminals support hotkeys and mousing: OS/2 Presentation Manager, X11, Windows, WX, and GGI. Hit 'h' in the terminal to get list of hotkeys. See `help new-features` or the **Features introduced in version 4.0** section in the docs for a brief guide over mousing and hotkeys. Further, you may read `help mouse` and `help bind` for more information.

## 5.8 I have ported gnuplot to another system, or patched it. What do I do?

If your patch is small, mail it to `gnuplot-beta@lists.sourceforge.net`, with a thorough description of what the patch is supposed to do, which version of **gnuplot** it is relative to, etc. Well, please do it always with respect to the current development version of gnuplot (see 'cvs' above).

Nowadays, the preferred way of submitting, commenting and upgrading patches are via 'Patches' section on `sourceforge.net/tracker/?group_id=2055&atid=302055`. You may want to send a note to `gnuplot-beta@lists.sourceforge.net` for more lively discussion.

## 5.9 I want to help in developing the next version of gnuplot. What can I do?

Join the **gnuplot** beta test mailing list by sending a mail containing the line `subscribe gnuplot-beta` in the body (not the subject) of the mail to `Majordomo@lists.sourceforge.net`.

## 5.10 Open questions for inclusion into the FAQ?

Please submit your questions (along with the answer) to `gnuplot-beta@lists.sourceforge.net`.

# 6 Making life easier

## 6.1 How do I plot two functions in non-overlapping regions?

Use a parametric plot. An example:

```
gnuplot> set parametric
gnuplot> a=1
gnuplot> b=3
gnuplot> c=2
gnuplot> d=4
gnuplot> x1(t) = a+(b-a)*t
gnuplot> x2(t) = c+(d-c)*t
gnuplot> f1(x) = sin(x)
gnuplot> f2(x) = x**2/8
gnuplot> plot [t=0:1] x1(t),f1(x1(t)) title "f1", x2(t), f2(x2(t)) title "f2"
```

You can also use **gnuplot's** ability to ignore mathematically undefined expressions: the expression  $1/0$  is silently ignored, thus a construction like

```
gnuplot> set xran [-10:10]
gnuplot> plot (abs(x)>0.5?1/0: x**2)
```

plots a quadratic function only for  $|x| < 0.5$ .

## 6.2 How do I run my data through a filter before plotting?

If your system supports the `popen()` function, as Unix does, you should be able to run the output through another process, for example a short awk program, such as

```
gnuplot> plot "< awk ' { print $1, $3/$2 } ' file.in"
```



The plot command is very powerful and is able to do some arithmetic on datafiles. See `help plot`.

The above filtering works seamlessly under Unixes and OS/2. It can work under MS Windows as well, but that is for experienced users: (A) When gnuplot has been compiled by cygwin with the unixish way of `./configure; make` with X11 terminal instead of the 'windows' terminal. You have to run this under an X-server. This procedure is out of knowledge for usual users, but powerful for others. (B) Compile gnuplot yourself by `makefile.mgw` or `makefile.cyg` and set `PIPES=1` therein. The drawback is that each `wgnuplot.exe` will be accompanied by a boring shell box.

### 6.3 How do I make it easier to use gnuplot with L<sup>A</sup>T<sub>E</sub>X?

There is a set of L<sup>A</sup>T<sub>E</sub>X macros and shell scripts that are meant to make your life easier when using **gnuplot** with L<sup>A</sup>T<sub>E</sub>X. This package can be found on `ftp.dartmouth.edu` in `pub/gnuplot/latex.shar`, by David Kotz. For example, the program "plotskel" can turn a gnuplot-output file `plot.tex` into a skeleton file `skel.tex`, that has the same size as the original plot but contains no graph. With the right macros, the skeleton can be used for preliminary L<sup>A</sup>T<sub>E</sub>X passes, reserving the full graph for later passes, saving tremendous amounts of time.

### 6.4 How do I save and restore my settings?

Use the `save` and `load` commands for this; see `help save` and `help load` for details.

You can save the current terminal and restore it later without touching the filesystem by `set term push` and `set term pop`, respectively.

### 6.5 How do I plot lines (not grids) using splot?

If the data in a data file for `splot` is arranged in such a way that each one has the same number of data points (using blank lines as delimiters, as usual), `splot` will plot the data with a grid. If you want to plot just lines, use a different number of data entries (you can do this by doubling the last data point, for example). Don't forget to set `parametric mode`, of course.

### 6.6 How do I plot a function f(x,y) that is bounded by other functions in the x-y plane?

An example:

```
gnuplot> f(x,y) = x**2 + y **2
gnuplot> x(u) = 3*u
gnuplot> yu(x) = x**2
gnuplot> yl(x) = -x**2
gnuplot> set parametric
gnuplot> set cont
gnuplot> splot [0:1] [0:1] u,yl(x(u))+(yu(x(u)) - yl(x(u)))*v,\
> f(x(u), (yu(x(u)) - yl(x(u)))*v)
```

### 6.7 How do I turn off <feature> in a plot?

Most gnuplot features are controlled by a corresponding `set/unset` command. If a feature is enabled by default, or by using `set <feature>`, then you should be able to turn it by using `set no<feature>`. However, the preferred syntax since version 4.0 is `unset <feature>`.

### 6.8 How do I call gnuplot from my own programs?

On unix-like systems, commands to gnuplot can be piped via `stdin`. Output from **gnuplot**'s `print` command can be read via a named pipe. On MS Windows platforms, due to the lacking standard input (`stdin`) in GUI programs, you need to use the helper program `pgnuplot` which should be included in your gnuplot for MSW distribution package. Reading **gnuplot** output may be impossible.

## 6.9 What if I need h-bar (Planck's constant)?

The most straightforward way is to use a UTF-8 font, and type in the  $\hbar$  character (Unicode code point #x210F) directly.

This does not work in PostScript, however, so you must use approximations like `@{/=56 -} {/=24 h}` or `{/=8 @{/Symbol=24 -} _{/=14 h}}`. In the latter, the "-" (a long one in /Symbol) is non-spacing and 24-pt. The 14-pt "h" is offset by an 8-pt space (which is the space preceding the "\_") but smaller, since it's written as a subscript. But these don't look too much like the hbar we're used to, since the bar is horizontal instead of sloped. I don't see a way to get that. I tried using an accent (character 264 in iso-latin-1 encoding), but I haven't found a way to scale and position the pieces correctly. One more possibility would be `{/=14 @^{/Symbol=10 -}{/=14 h}}`.

The reduced Planck's constant can be set very easily by using the AMS-LaTeX PostScript fonts which are available from [www.ams.org/tex/amsfonts.html](http://www.ams.org/tex/amsfonts.html) (also included in many LaTeX distributions). **Gnuplot** (confer the help about `fontpath`) and the PostScript interpreter (usually Ghostscript) have to know where the file `msbm10.pfb` (or `msbm10.pfa`) resides. Use `{/MSBM10 \175}` to produce `\hslash` which is a "h" superimposed by a sloped bar. The standard `\hbar` (horizontal bar) has the octal code 176. Please note that h-bar exists only as an italic type.

## 6.10 What if I need the Solar mass symbol?

As with Planck's constant, the most straightforward way is to use a UTF-8 font, and type in the  $\odot$  character (Unicode code point #x2299 ; "circled dot operator") directly. The very similar glyph at code point #x2609 ; "sun" may be even better, but not many fonts have it.

## 6.11 How do I produce blank output page?

Well, you probably don't want a blank page, but page with a just a title (overprinting title in another graph in multiplot page):

```
reset; unset xtics; unset ytics
unset border; unset key
set title 'Title on an empty page'
plot [][0:1] 2
```

## 6.12 How do I produce graph of an exact border size?

Specify the position of the top, bottom, left, and right borders in terms of their fractional position within the page:

```
set lmargin at screen 0.05
set bmargin at screen 0.05
set rmargin at screen 0.95
set tmargin at screen 0.95
```

# 7 Common problems

## 7.1 Help! None of my fonts work.

Gnuplot does not do font handling by itself; it must necessarily leave that to the individual device support libraries. Unfortunately, this means that different terminal types need different help in finding fonts. Here are some quick hints. For more detailed information please see the gnuplot documentation for the specific terminal type you are having problems with.

**png/jpeg/gif** These terminal types use the libgd support library, which searches for fonts in the directories given in the environmental variable `GDFONTPATH`. Once you get libgd fontpaths sorted out, you will probably want to set a default font for gnuplot. For example: `setenv GNUPLOT_DEFAULT_GDFONT verdana`

**pdf** The libpdf support library should have come with an associated font configuration file, usually installed as `/usr/local/share/pdfcups`. The environmental variable `PDFLIBRESOURCE` should point to this file.

**post** PostScript font names are not resolved until the document is printed. Gnuplot does not know what fonts are available to your printer, so it will accept any font name you give it. However, it is possible to bundle a font with the gnuplot output; please see the instructions given by gnuplot's internal command "help set term post fontfile".

**svg** Font handling is viewer-dependent.

**x11** The x11 terminal uses the normal x11 font server mechanism. The only tricky bit is that in order to use multi-byte fonts you must explicitly say so:

```
set term x11 font "mbfont:sazanami mincho,vera,20"
```

**win** Right-click in the control window, then select "Choose font" from the pull-down menu.

**wxt** On linux systems, the wxt terminal can find fonts indexed by the fontconfig utility.

## 7.2 Gnuplot is not plotting any points under X11! How come?

On VMS, you need to make several symbols:

```
$ gnuplot_x11 := $disk:[directory]gnuplot_x11
$ gnuplot := $disk:[directory]gnuplot.exe
$ def/job GNUPLOT$HELP disk:[directory]gnuplot.hlb
```

Then run **gnuplot** from your command line, and use `set term x11`.

If you run **gnuplot** on Unix systems, be sure that the newest `gnuplot_x11` is the first in your search path. Command `which gnuplot_x11` will help you.

## 7.3 Why does gnuplot ignore my very small numbers?

**Gnuplot** treats all numbers less than  $1e-08$  as zero, by default. Thus, if you are trying to plot a collection of very small numbers, they may be plotted as zero. Worse, if you're plotting on a log scale, they will be off scale. Or, if the whole set of numbers is "zero", your range may be considered empty:

```
gnuplot> plot 'test1'
Warning: empty y range [4.047e-19:3e-11], adjusting to [-1:1]
gnuplot> set yrange [4e-19:3e-11]
gnuplot> plot 'test1'
      ^
y range is less than `zero`
```

The solution is to change **gnuplot**'s idea of "zero":

```
gnuplot> set zero 1e-20
```

For more information, type `help set zero`.

## 7.4 Gnuplot is not plotting on the screen when run from command line via 'gnuplot filename.gp'

Obviously, it draws (unless there is an error in the script file), but the plot disappears immediately when the script is completed.

Solution 1: Put a `pause -1` after the plot command in the file, or at the file end.

Solution 2: Use command `gnuplot filename.gp -` (yes, dash is the last parameter) to stay in the interactive regime when the script completes.

Solution 3A: On an X-Window System system, you can also use the `-persist` option, the X11 window is then not closed. Close the X11 window by typing "q" when the focus is on it.

Solution 3B: On M\$ Windows, you can also use either `-persist` or `/noend`.

Solution 4: For OS/2 PM terminal, use `set term pm persist` or `set term pm server`. For X11 terminal, use `set term x11 persist`.

## 7.5 My formulas (like 1/3) are giving me nonsense results! What's going on?

**Gnuplot** does integer, and not floating point, arithmetic on integer expressions. For example, the expression `1/3` evaluates to zero. If you want floating point expressions, supply trailing dots for your floating point numbers. Example:

```
gnuplot> print 1/3
          0
gnuplot> print 1./3.
          0.333333
```

This way of evaluating integer expressions is shared by both C and Fortran.

## 7.6 My output files are incomplete!

You may need to flush the output with a closing `set output`. Some output formats (postscript, pdf, latex, svg, ...) can include several pages of plots in a single output file. For these output modes, gnuplot leaves the file open after each plot so that you can add additional plots to it. The file is not completed and made available to external applications until you explicitly close it (`set output` or `unset output`), or select a different terminal type (`set term`) or exit gnuplot. Output formats that contain only a single 'page' (png, emf, ...) should not suffer from this problem.

## 7.7 When using the L<sup>A</sup>T<sub>E</sub>X-terminal, there is an error during the L<sup>A</sup>T<sub>E</sub>X-run!

The L<sup>A</sup>T<sub>E</sub>X2<sub>ε</sub>-core no longer includes the commands `"\Diamond"` and `"\Box"`; they are included in the `latexsym` package. Other symbols are taken from the `amssymb` package. Both of these are part of the base distribution and thus part of any LaTeX implementation. Please remember to include these packages in your LaTeX document.

## 7.8 I can't find the demos and example files at the URLs in the documentation!

The examples have been removed from the NASA site mentioned in older documentation. You can find demos from the current version at [gnuplot.sourceforge.net/demo](http://gnuplot.sourceforge.net/demo). Examples from the development version are at [gnuplot.sourceforge.net/demo\\_cvs](http://gnuplot.sourceforge.net/demo_cvs).

## 7.9 Calling gnuplot in a pipe or with a gnuplot-script doesn't produce a plot!

You can call **gnuplot** by using a short Perl-script like the following:

```
#!/usr/local/bin/perl -w
open (GP, "|/usr/local/bin/gnuplot -persist") or die "no gnuplot";
# force buffer to flush after each write
use FileHandle;
GP->autoflush(1);
print GP, "set term x11;plot '/tmp/data.dat' with lines\n";
close GP
```

**Gnuplot** closes its plot window on exit. The `close GP` command is executed, and the plot window is closed even before you have a chance to look at it.

There are three solutions to this: first, use the `pause -1` command in **gnuplot** before closing the pipe. Second, close the pipe only if you are sure that you don't need **gnuplot** and its plot window anymore. Last, you can use the command line option `-persist`: this option leaves the X-Window System plot window open.

## 8 Credits

**Gnuplot** 3.7's main contributors are (in alphabetical order) Hans-Bernhard Broeker, John Campbell, Robert Cunningham, David Denholm, Gershon Elber, Roger Fearick, Carsten Grammes, Lucas Hart, Lars Hecking, Thomas Koenig, David Kotz, Ed Kubaitis, Russell Lang, Alexander Lehmann, Alexander Mai, Carsten Steger, Tom Tkacik, Jos Van der Woude, James R. Van Zandt, and Alex Woo. Additional substantial contributors to version 4.0 include Ethan Merritt, Petr Mikulík and Johannes Zellner. Version 4.2 and 4.4 releases were coordinated by Ethan Merritt.

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