### Syntax

```
twoway function [ [y] = ] f(x) [if] [in] [ , options ]
```

<table>
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<th>options</th>
<th>Description</th>
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<td>range(# #)</td>
<td>plot over x = # to #</td>
</tr>
<tr>
<td>range(varname)</td>
<td>plot over x = min to max of varname</td>
</tr>
<tr>
<td>n(#)</td>
<td>evaluate at # points; default is 300</td>
</tr>
<tr>
<td>droplines(numlist)</td>
<td>draw lines to axis at specified x values</td>
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<tr>
<td>base(#)</td>
<td>base value for dropline(); default is 0</td>
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<td>horizontal</td>
<td>draw plot horizontally</td>
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<tr>
<td>yvarformat(%)fmt</td>
<td>display format for y</td>
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<tr>
<td>xvarformat(%)fmt</td>
<td>display format for x</td>
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<tr>
<td>cline_options</td>
<td>change look of plotted line</td>
</tr>
<tr>
<td>axis_choice_options</td>
<td>associate plot with alternative axis</td>
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<tr>
<td>twoway_options</td>
<td>titles, legends, axes, added lines and text, by, regions, name, aspect ratio, etc.</td>
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If `exp` and `in range` play no role unless option `range(varname)` is specified.

In the above syntax diagram, $f(x)$ stands for an expression in terms of $x$.

### Menu

Graphics  >  Twoway graph (scatter, line, etc.)

### Description

`twoway function` plots $y = f(x)$, where $f(x)$ is some function of $x$. That is, you type

```
   . twoway function y=sqrt(x)
```

It makes no difference whether $y$ and $x$ are variables in your data.
Options

`range(# #)` and `range(varname)` specify the range of values for `x`. In the first syntax, `range()` is a pair of numbers identifying the minimum and maximum. In the second syntax, `range()` is a variable name, and the range used will be obtained from the minimum and maximum values of the variable. If `range()` is not specified, `range(0 1)` is assumed.

`n(#)` specifies the number of points at which \( f(x) \) is to be evaluated. The default is `n(300)`.

`droplines(numlist)` adds dropped lines from the function down to, or up to, the axis (or `y = base()`) if `base()` is specified) at each `x` value specified in `numlist`.

`base(#)` specifies the base for the `droplines()`. The default is `base(0)`. This option does not affect the range of the axes, so you may also want to specify the `axis_scale_option yscale(range(#))` as well; see [G-3] `axis_scale_options`.

`horizontal` specifies that the roles of `y` and `x` be interchanged and that the graph be plotted horizontally rather than vertically (that the plotted function be reflected along the identity line).

`yvarformat(%,fmt)` and `xvarformat(%,fmt)` specify the display format to be used for `y` and `x`. These formats are used when labeling the axes; see [G-3] `axis_label_options`.

`cline_options` specify how the function line is rendered; see [G-3] `cline_options`.

`axis_choice_options` associate the plot with a particular `y` or `x` axis on the graph; see [G-3] `axis_choice_options`.

`twoway_options` are a set of common options supported by all `twoway` graphs. These options allow you to title graphs, name graphs, control axes and legends, add lines and text, set aspect ratios, create graphs over by() groups, and change some advanced settings. See [G-3] `twoway_options`.

Remarks and examples

Remarks are presented under the following headings:

- Typical use
- Advanced use 1
- Advanced use 2
Typical use

You wish to plot the function \( y = \exp(-x/6) \sin(x) \) over the range 0 to \( 4\pi \):

```
    . twoway function y=exp(-x/6)*sin(x), range(0 12.57)
```

A better rendition of the graph above is

```
    . twoway function y=exp(-x/6)*sin(x), range(0 12.57)
      yline(0, lstyle(foreground))
      xlabel(0 3.14 "\&pi" 6.28 "2\&pi" 9.42 "3\&pi" 12.57 "4\&pi")
      plotregion(style(none))
      xsca(noline)
```

\texttt{yline(0, lstyle(foreground))} added a line at \( y = 0 \); \texttt{lstyle(foreground)} gave the line the same style as used for the axes. See \cite{G-3} \texttt{added_line_options}.

\texttt{xlabel(0 3.14 "\&pi" 6.28 "2\&pi" 9.42 "3\&pi" 12.57 "4\&pi")} labeled the \( x \) axis with the numeric values given; see \cite{G-3} \texttt{axis_label_options}. 
plotregion(style(none)) suppressed the border around the plot region; see [G-3] region_options.

xsca(noline) suppressed the drawing of the x-axis line; see [G-3] axis_scale_options.

Advanced use 1

The following graph appears in many introductory textbooks:

```
. twoway
   function y=normalden(x), range(-4 -1.96) color(gs12) recast(area)
   function y=normalden(x), range(1.96 4) color(gs12) recast(area)
   function y=normalden(x), range(-4 4) lstyle(foreground)
   plotregion(style(none))
   ysca(off) xsca(noline)
   legend(off)
   xlabel(-4 "-4 sd" -3 "-3 sd" -2 "-2 sd" -1 "-1 sd" 0 "mean"
          1 "1 sd" 2 "2 sd" 3 "3 sd" 4 "4 sd"
          , grid gmin gmax)
   xtitle(""
```

We drew the graph in three parts: the shaded area on the left, the shaded area on the right, and then the overall function. To obtain the shaded areas, we used the advanced_option recast(area) so that, rather than the function being plotted by graph twoway line, it was plotted by graph twoway area; see [G-3] advanced_options and [G-2] graph twoway area. Concerning the overall function, we drew it last so that its darker foreground-colored line would not get covered up by the shaded areas.
Advanced use 2

Function plots may be overlaid with other `twoway` plots. For instance, `function` is one way to add \( y = x \) lines to a plot:

```stata
. use http://www.stata-press.com/data/r13/sp500, clear
   (S&P 500)
. scatter open close, msize(*.25) mcolor(*.6) ||
   function y=x, range(close) yvarlab("y=x") clwidth(*1.5)
```

In the above, we specified the `advanced_option` `yvarlab("y=x")` so that the variable label of \( y \) would be treated as “\( y=x \)” in the construction of the legend; see [G-3] `advanced_options`. We specified `msize(*.25)` to make the marker symbols smaller, and we specified `mcolor(*.6)` to make them dimmer; see [G-4] `relativesize` and [G-4] `colorstyle`.

Reference


Also see

[G-2] `graph twoway line` — Twoway line plots