

# FX Graph V3 Quick Reference Card

## Entering a Function

Access the quick function entry screen by

- Pushing the  button
- or Clicking the right mouse button
- or Choosing Edit/Functions from the menus

Type a function into the Functions box. Each line is a separate function

Press Enter

## Entering Functions

On most occasions you will be able to type the equation as you see it and FX Graph will interpret it correctly.

$$3x^3 - 2x^2 + \frac{3}{2}$$

Adding "y =" to the front of the function definition is optional for Cartesian functions (but not other types of functions or inequations)

There are a limited number of codes and keywords you must learn in order to enter every possible function.

### Codes to Remember

< =	≤
> =	≥
*	×
/ (followed by a space)	÷
pi	π
th	θ
sqrt 3	$\sqrt{3}$
sr(x <sup>2</sup> + y <sup>2</sup> )	$\sqrt{x^2 + y^2}$
3root x	$\sqrt[3]{x}$

### Fractions

Fractions are entered using the / key. Complex numerators or denominators must be surrounded with brackets. These brackets are logical brackets and will not be displayed.

$$\frac{\pi}{6}$$
$$\frac{(3x+2)/4}{4}$$

### Spaces in Functions

Spaces in functions can determine their meaning.

$$\sin^2 x$$
$$\sin 2x$$

The only difference is the location of a space in the entered function.

### Power

The power symbol is used to force an expression to be a power when FX Graph does not automatically recognize it.

$$2^x$$
$$3^{x+2}$$
$$e^{x^2}$$

### Polar Functions

Enter these using r and th (which will be shown as θ)

$$r = 2\sin 2\ 3th$$
$$r = 2\sin^2 3\theta$$

## Inverse Functions

Enter by typing x in terms of y

$$x = \frac{12}{y}$$

## Inequations

Inequations can be drawn for Cartesian, Inverse and Polar graphs. Replace the = with >=, <=, > or <

$$y \geq 3x - 7$$
$$r < \sin \theta$$

FX Graph can shade just the feasible region for a set of inequations.

## Parametric Functions

Enter the x and y components in terms of t. Separate the components with a semicolon (or a colon if you use a comma as a decimal point).

$$x = \sin t; y = \cos 3t$$

Parametric functions are graphed with a default domain of  $0 \leq t \leq 20$  unless otherwise specified.

## Implicitly Defined Relations

FX Graph can graph any function expressed in terms of x & y. FX Graph will try to rearrange the relation in terms of x or y. If FX Graph cannot rearrange the relation, it will graph the relation using a different technique that restricts the analysis that FX Graph can perform.

## Points and Vectors

(2,3)	plots a point.
(2,3) (1,2) (-1,3)	plots multiple points.
(2,3)+(1,2)+(-1,3)	plots points and joins them.
<2,3>	plots a vector.
<2,3>+<1,1>-<0,3>	vector addition / subtraction.
(1,2)+<2,3>	vector addition from a point.

Note: If you use a comma as a decimal point, you must use a semicolon between the coordinates (eg 2;3)

## Axes

FX Graph automates most aspects of setting the axes and scales on your graph. On most occasions you will only need to access the quick function entry screen.

### Axes Labels

By default, FX Graph will label the axes as 'x' and 'y'. These defaults can be changed on the quick function entry screen.

### Scroll Bars

The two scroll bars on the quick function entry screen allow you to set the shape of the graph you require. Simply slide the scroll bars until you see the shape you want. You should set the shape FIRST.

### Set Maxima

The x Max and y Max edit boxes allow you to set the maximum x and y values for your graph. You should set the maxima SECOND. FX Graph will automatically set the scales for the axes to allow for the shape and maxima you have entered.

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## $\pi$ on Your Axes

If you wish to have axes scaled in multiples of  $\pi$ , enter the x Max value as **2 $\pi$** ,  **$\pi/2$**  or any other multiple of  $\pi$ . FX Graph will do the rest.

## AutoScaling

The AutoScale option on the quick function entry screen will automatically set the scales on your axes to suit the functions you have entered. It will include all points of interest (local maxima and minima, intercepts and points of intersection) in the viewable area.

Please note:


- Autoscale can sometimes be fooled and it will not always make the point you are interested in visible.
- Sometimes a distant point of interest will mean that the maxima are set so high that the area you are interested in is too small.

## Points of Interest

Points of interest include x intercepts, y intercepts, local maxima, local minima, points of discontinuity, vertical asymptotes, integrals, tangent lines, points of horizontal inflexion and points of intersection. FX Graph automatically identifies points of interest for entered functions. To display these points of interest, just move your mouse around the screen.

## Annotations

Annotations are labels attached on your graph. Annotations can contain any information you wish but usually contain some automatically generated information regarding your graph.

Push the  button to create annotations. There are three ways of creating annotations.

- Left Click – a blank annotation will be created.
- Left Click, Hold, Move Release – A blank annotation will be created with an anchor (an arrow).
- Move until a point of interest is displayed, then right click – an annotation, containing the point of interest information, will be created.

## Editing Annotations

Right Click on them. The check boxes down the left hand side of the dialog box, determine if FX Graph interprets your entries as equations or plain text.

## Finding Things

FX Graph offers a number of ways of finding points on the plane.

## Moving Around the Plane

You can move around the plane by pressing the arrow keys. FX Graph will break the axes if you have allowed it to. Pressing the Home Key will center the view on the origin.

## Keyboard Zooming.

The Page Up and Page Down keys will change the scale.

## Mouse Zooming

Press the  button

Click the Left mouse button and FX Graph will zoom in, centered on the mouse click.

Sketch a rectangle with the mouse and FX Graph will zoom in to the rectangle.

Right Click and FX Graph will zoom out to the previous settings – sort of a zooming undo.

## Greater Control

Right click to gain extra control over functions and axes. The Function, Axes and Grid buttons on the Quick Entry screen also give you greater control over the display.

## Changing a Function's Domain

By default, FX Graph will graph the function over the domain implied by the scales you have set. If you wish to restrict the domain of a function, add domain information after a semi colon. You can enter domains in two ways:

$x2 ; -2 \leq x < 3$                       OR                       $x2 [-2,3)$

If you use a comma as a decimal point then you should enter domains as

$x2 : -2 \leq x < 3$                       OR                       $x2 [-2;3)$

The semicolon (colon) is not necessary using the second style.


## Analytical Tools

FX Graph provides a number of tools that allow you to analyze your graphs.


## Derivative Curves

FX Graph can graph the first and second derivative curves of Cartesian functions. You can turn these on by right clicking on a function or by pushing the Function button in the Quick Entry screen.

## Tangent Lines

You can add a tangent line to a Cartesian function by choosing Tangent Line from the Tools menu OR you can push the  button and add tangent lines with a mouse click. Tangent lines can be selected and moved dynamically with the left and right arrow keys.

## Definite Integrals

Definite integrals of functions can be found using the Find Integral option in the Tools menu OR you can push the  button and add integrals with your mouse. Move your mouse until FX Graph detects a function. Click and hold the left mouse button. Move your mouse to define the integral.

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