

# Grapher-3D

## User's Manual

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Michael Paul Mesnier  
Northeast Missouri State University  
Kirksville, Mo. 63501

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# Project's Purpose

Grapher-3D provides users with a visual aid to three dimensional functions. Unlike two dimensional functions, the complexity of a three dimensional function prevents an easy sketching by hand. Further, Grapher-3D allows users to quickly change their position and “view” the function from any point in three-space.

# Project's Functionality

Grapher-3D has made enormous strides since the inception of my “Grapher” projects. The original Grapher-2D, coded entirely in Apple Pascal, only accomodated a single, hard-coded function, and viewing new functions necessarily required recompilation. Grapher-3D, however, allows numerous three-dimensional functions to be plotted without ever leaving the application.

# Use of Grapher-3D

## I. Plotting a surface.

By default, Grapher-3D begins in graphics mode with an interesting surface preloaded for your enjoyment. You can either experiment with this surface or escape to the main menu and create your own. Find listed below a description of the hot keys available while viewing a surface. Note that these keys are also described in ‘Instructions’ from the main menu.

x : Rotates surface about the  $x$  axis.  
y : Rotates surface about the  $y$  axis.  
z : Rotates surface about the  $z$  axis.

Note: The resolution of a surface is the number of points that constitute each line of the graph. Smooth “animation” can be achieved with lower resolutions, where finer looking surfaces require higher resolutions.

c : Changes the surfaces color.  
(An option I included for all the users who find it necessary to ask “Can it change colors?”)

1 : Stretches  $z$  axis.  
2 : Shrinks  $z$  axis.  
3 : Turns range checking on.  
4 : Turns range checking off. (default)  
5 : Decreases the resolution of the surface.  
6 : Increases the resolution of the surface.

Note: Range checking prevents surfaces from “wrapping” around the screen.

+ : Enlarges surface.  
- : Reduces surface.  
m : Exit to main menu.  
q : Quit Grapher-3D.

## II. Creating a New Funtion

Creating functions in Grapher-3D requires a familiarity with postfix notation (later releases will accept infix expressions). With little practice, postfix expressions will become second nature. Included below are the defined functions in Grapher-3D along with a few examples.

x	:	denotes the variable $x$ in the function $f(x, y)$ .
y	:	denotes the variable $y$ in the function $f(x, y)$ .
+	:	addition (e.g. $x + y = xy+$ ).
-	:	subtraction (e.g. $x - y = xy-$ ).
*	:	multiplication (e.g. $x * (x + y) = xy+x*$ ).
/	:	division (e.g. $x / (x * y) = xy*x/$ ).
^	:	exponents (e.g. $x^2 = x2^$ ).
s	:	sine (e.g. $\sin(x * y) = xy*s$ ).
c	:	cosine (e.g. $\cos(x * y - 1) = xy*1-c$ ).
e	:	exponent base e (e.g. $\exp(x/y) = xy/e$ ).
l	:	natural log (e.g. $\ln(x - y)/(x + 1) = xy-lx1+ /$ ).
n	:	negation (e.g. $-(x + y) = xy+n$ ).
a	:	absolute value (e.g. $abs(x) = xa$ ).

Note about constants: Only integer constants are allowed.

## III. Domain

After selecting 'Domain' from the main menu, you will be prompted to enter the minimum and maximum x values along with the minimum and maximum y values. Both real and integer values are allowed.

## IV. Instructions

Choosing 'Instructions' from the main menu will provide the user with a screenful of helpful information describing the available hot keys while in graphics mode.

# Program Bugs

Be careful when using exponential functions, they tend to grow extremely fast and produce overflow and/or underflow errors. Later releases will have run-time checks on function arguments. Also, when using higher resolutions, the super-vga library has been known to crash with a segmentation violation (ouch!).