

Dynamic Photorealistic Graphing (DPGraph) -- the world's most powerful 2D through 8D graphing software, optimized for the internet.

COMMON ERRORS: The seven most common mistakes when creating graphs in the EDIT dialog box are: 1) leaving out asterisks for multiplication; 2) leaving out equals signs or inequality signs; 3) leaving out the parentheses for lists; 4) trying to use equalities in intersections (DPGraph can only intersect inequalities, i.e. regions of space); 5) putting a space inside the two-character symbols :=, >=, or <=; 6) using the parametric variables u or v in implicit graphs; and 7) using the implicit variables x, y, z, r, theta, rho, or phi in parametric graphs.

WRONG:

graph3d(3x = z^2)

graph3d(x^2+y^2)

graph3d(x=1, y=1)

graph3d(x=1 & y=1)

graph3d(z^2>=x^2)

graph3d(z=u^2+v^2)

graph3d(rectangular(x,y,sin(x+y)))

RIGHT:

graph3d(3*x = z^2)

graph3d(z = x^2+y^2)

graph3d((x=1, y=1))

graph3d(x>1 & y>=1)

graph3d(z^2 >= x^2)

graph3d(z=x^2+y^2)

graph3d(rectangular(u,v,sin(u+v)))

INEQUALITIES: When graphing an inequality, such as GRAPH3D(X>1), remember that "blue is true"; the bluest side of the graph is the region of space for which the inequality is true, the reddest side of the graph is the region of space for which the inequality is false. If the inequality is true for the surface itself, as in GRAPH3D(X>=1), then the bluest side is pure blue; if the inequality is false for the surface itself, as in GRAPH3D(X>1), then the reddest side is pure red.

DEFAULTS.DPG: With experience you may find the following technique useful when exploring a new surface. OPEN the file DEFAULTS.DPG, go to EDIT, modify the default equation, and then EXECUTE. Since all of the options are already in DEFAULTS.DPG they can be changed with very little typing. If you like, SAVE the modified file under a different name and it will be ready for future viewing and adjustments.

RESOLUTION: The easiest way to improve the appearance of some graphs is to increase the resolution. The default resolution is 21 by 21 by 21 for implicit graphs, and 40 by 40 for parametric surfaces. To change the resolution for implicit graphs, use the EDIT dialog box to insert a line such as the following before the GRAPH3D command:

graph3d.resolution := 30

For parametric surfaces:

graph3d.stepsu := 50

graph3d.stepsv := 50

You may find it useful to use the technique described in the previous section on DEFAULTS.DPG.

COPYING A GRAPH TO THE CLIPBOARD: Click on CLIPBOARD to copy a picture of the graph to the clipboard. To copy a picture of the entire window (including the border, etc.) to the clipboard, simultaneously press down the ALT and PRINTSCREEN keys. To copy a picture of the whole screen to the clipboard, press PRINTSCREEN.

COPYING A GRAPH INTO ANOTHER APPLICATION: If the other application supports pasting, first copy the graph to the clipboard. Then click on EDIT in the other application, then click on PASTE.

PRINTING A GRAPH: First copy the the graph to an application, such as Word or Paint, that supports printing. Then click on FILE in the other application, then click on PRINT.

FILE FORMAT: DPGraph files have a file type of .DPG. There are two kinds of DPG files: binary and ASCII. DPGraph can read and write either type of DPG file, but the DPGraph Viewer can only read binary DPG files.

Binary DPG files are compressed and contain error detection information for more reliable transmission.

ASCII DPG files are readable and editable by Notepad and many other text editors. Each line in the file is a separate command for DPGraph. For example, a file might look like this:

```
graph3d.view:=top  
graph3d.perspective:=false  
graph3d(z=3*sin(x*y))
```

Each command must start on a separate line. The GRAPH3D command must be the last command.

UNINSTALLATION: There are two ways to remove DPGraph from your hard disk drive. Method 1: click on START - SETTINGS - CONTROL PANEL - ADD/REMOVE PROGRAMS, then scroll to DPGraph in the window, select it, and click on ADD/REMOVE. Method 2: click on START - PROGRAMS - DPGRAPH - UNINSTALL.

OPTIONS: Non-numeric default values are given in capital letters.

graph3d.resolution	(resolution along longest side of box, default is 21; other sides of box have a resolution proportional to the length of the side)
graph3d.mesh	(TRUE or false)
graph3d.perspective	(TRUE or false)
graph3d.box	(TRUE or false)
graph3d.view	(STANDARD, top, side, front, or textbook)
graph3d.contrast	(default is 1/2, range is 0 to 1)
graph3d.transparency	(default is 0, range is 0 to 1)
graph3d.background	(black, gray, WHITE, brown, red, yellow, green, cyan, blue, or magenta)
graph3d.color	(BYHEIGHT, bysteepness, black, gray, white, brown, red, yellow, green, cyan, blue, magenta, or an expression depending on x, y, z, or time)
graph3d.highlight	(default is 0, range is 0 to 1)
graph3d.shading	(default is 0, range is 0 to 1)
graph3d.vectorcolor	(BYHEIGHT, bysteepness, black, gray, white, brown, red, yellow, green, cyan, blue, magenta, or an expression depending on x, y, z, or time)
graph3d.vectorhighlight	(default is 0, range is 0 to 1)
graph3d.vectorshading	(default is 0, range is 0 to 1)
graph3d.vectoralign	(TAIL, center, or tip)
graph3d.vectorarrowhead	(true or FALSE)
graph3d.minimumx	(default is -3)
graph3d.maximumx	(default is 3)
graph3d.minimumy	(default is -3)
graph3d.maximumy	(default is 3)
graph3d.minimumz	(default is -3)
graph3d.maximumz	(default is 3)
graph3d.minimumu	(default is -3)
graph3d.maximumu	(default is 3)
graph3d.stepsu	(default is 40)
graph3d.minimumv	(default is -3)
graph3d.maximumv	(default is 3)
graph3d.stepsv	(default is 40)
a.minimum	(scrollbar variable minimum value)
a.maximum	(scrollbar variable maximum value)
b.minimum	(scrollbar variable minimum value)
b.maximum	(scrollbar variable maximum value)
c.minimum	(scrollbar variable minimum value)
c.maximum	(scrollbar variable maximum value)
d.minimum	(scrollbar variable minimum value)
d.maximum	(scrollbar variable maximum value)

VALUES FOR OPTIONS:

true (for mesh, perspective, box, and vectorarrowhead)
false (for mesh, perspective, box, and vectorarrowhead)
standard (for view, x is the most horizontal axis)
textbook (for view, y is the most horizontal axis)
top (for view)
front (for view)
side (for view)
byheight (for color or vectorcolor)
bysteepness (for color or vectorcolor)
black (for color, vectorcolor, or background)
gray (for color, vectorcolor, or background)
white (for color, vectorcolor, or background)
brown (for color, vectorcolor, or background)
red (for color, vectorcolor, or background)
yellow (for color, vectorcolor, or background)
green (for color, vectorcolor, or background)
cyan (for color, vectorcolor, or background)
blue (for color, vectorcolor, or background)
magenta (for color, vectorcolor, or background)
tail (for vectoralign)
center (for vectoralign)
tip (for vectoralign)

CONSTANTS:

e (base of natural logarithms)
#e (base of natural logarithms for Derive users)
pi (pi)

VARIABLES:

x (x variable for implicit graphing)
y (y variable for implicit graphing)
z (z variable for implicit graphing)
r (polar radius, $r = \sqrt{x^2 + y^2}$)
theta (polar angle, $0 \leq \theta < 2\pi$, $\theta = \text{angle}(-x, -y) + \pi$)
rho (spherical radius, $\rho = \sqrt{x^2 + y^2 + z^2}$)
phi (spherical angle, $0 \leq \phi \leq \pi$, $\phi = \text{angle}(z, r)$)
u (u variable for parametric graphs)
v (v variable for parametric graphs)
a (a variable for scrollbar)
b (b variable for scrollbar)
c (c variable for scrollbar)
d (d variable for scrollbar)
time (current time for graphs that change with time)

SYMBOLS:

=	(equals, for entering equations)
<	(less than, for entering inequalities)
>	(greater than, for entering inequalities)
<=	(less than or equal, for entering inequalities)
>=	(greater than or equal, for entering inequalities)
&	(intersection)
:=	(assignment, for assigning values)
(...)	(lists of arguments or equations)
+	(addition or leading plus sign)
-	(subtraction or leading minus sign)
*	(multiplication)
/	(division)
^	(powers)
...	(absolute value, same as abs(...))
!	(factorial)

ONE ARGUMENT FUNCTIONS:

abs	(absolute value, same as ...)
acos	(arccosine)
acosh	(hyperbolic arccosine)
acot	(arccotangent)
acoth	(hyperbolic arccotangent)
acsc	(arccosecant)
acsch	(hyperbolic arccosecant)
asec	(arcsecant)
asech	(hyperbolic arcsecant)
asin	(arcsine)
asinh	(hyperbolic arcsine)
atan	(arctangent)
atanh	(hyperbolic arctangent)
ceiling	(smallest integer \geq argument)
cos	(cosine)
cosh	(hyperbolic cosine)
cot	(cotangent)
coth	(hyperbolic cotangent)
csc	(cosecant)
csch	(hyperbolic cosecant)
floor	(greatest integer \leq argument)
gamma	(gamma function)
ln	(log base e)
log	(log base 10)
nonneg	(1 if argument ≥ 0 , else undefined)
one	(1 if $0 \leq$ argument ≤ 1 , else undefined)
sec	(secant)
sech	(hyperbolic secant)
sign	(-1 if negative, 1 if positive, indefinite if 0 or indefinite)
sin	(sine)
sinh	(hyperbolic sine)
sqf	(square)
sqrt	(square root)
tan	(tangent)
tanh	(hyperbolic tangent)

TWO ARGUMENT FUNCTIONS:

angle (-pi <= angle of (x,y) from positive x axis <= pi)
beta (beta function)

THREE ARGUMENT FUNCTIONS:

cylindrical (parametric graph in cylindrical coordinates)
near (1 if (x,y,z) is near current grid, else undefined)
rectangular (parametric graph in rectangular coordinates)
spherical (parametric graph in spherical coordinates)
vector (graphs a vector field)

KNOWN PROBLEMS:

- 1) Microsoft WordPad under Windows NT 4.0 makes embedded graphs, or graphs copied from the clipboard, too large. It also truncates the graphs on the right hand side.
- 2) Microsoft Paint in 256 color mode decreases the number of colors in the graphs to 16.