3DGraphs

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What is it?

Its a web page which will draw lines and surfaces in 3D.

Quick start

Under ‘z=f(x,y) surface’, click Surface. That’s it.

You start seeing x y and z axes. The x axis is red and y is green. The yellow z axis will remain vertical. All axes are drawn in the range -5 to +5

Built-in functions

The following are built-in: sin, abs, acos, atan, ceil, exp, floor, log, pow, sqrt, tan and cos.
Used like sin(2*x+3).

Background

Usually we plot a graph of a function with x horizontally and y vertically. An example would be y=3x+2.

In this 3D version we have x and y on a horizontal plane, with z plotted vertically. We can use this in different ways:

z=f(x,y)

This plots z as a function of two independent variables, x and y. For each (x,y) point on the plane, we plot z vertically above or beneath the plane. The default example is $z=\frac{x^2+y^2}{5}$, which produces a shape called a paraboloid.

z=f(r,θ)

This is like z=f(x,y) but uses polar co-ordinates. (r,θ) picks out a point on the horizontal plane, then z is plotted as a function of r and θ vertically. So z=r is a cone, symmetrical around the z axis and not dependent on θ. z=θ is a spiral, with z increasing with θ around the z axis. r*θ/5 is a combination of a cone and a spiral.

Parametric surface

Here the independent variables are parameters u and v. These vary through some ranges (which can be entered), and x,y and z are functions of u and v.

The default is

x= 2 cos(u) sin(v)

y = 2 cos(u) cos(v)

z = 2 sin(v)

which is the surface of a sphere radius 2 centre at the origin. This is a sphere in spherical co-ordinates, with v the angle around the z axis, and u the azimuthal angle down from +z to -z. So v ranges from 0 to 2π (all the way round), and u goes from -π/2 (straight down) to+π/2 (straight up).

Parametric line

x y and z are defined in terms of a single parameter, t. As t varies, x y and z vary, producing a line. In the default, z=t/5, so z just increases with t. x and y have a factor sin and cos t, which would produce a horizontal circle. But the other factor t increases the radius of the circle, so we get a spiral.