3d Plots in Maple

1. Plot $z = f(x, y)$ in Cartesian coordinates using

$$ \text{plot3d} \left( f(x, y), x = a..b, y = c..d \right). $$

Consider the options

- **a)** style = patchcontour Puts contour curves on the surface.
- **b)** axes = boxed Puts the axes on the edges of a box enclosing the surface.
- **c)** scaling = constrained Makes the scale on the three axes the same.
- **d)** orientation = [40, 70] Orient the viewpoint so it is closer to what you see in your text.

2. Plot $F(x, y, z) = 0$ in Cartesian coordinates using

$$ \text{implicitplot3d} \left( F(x, y, z) = 0, x = a..b, y = c..d, z = s..t \right). $$

First load the plots package using the entry with(plots):

Consider the options listed above along with the following.

- **e)** grid = $[m, n, k]$ Where m, n, k are positive integers, try 30, 30, 30 for example. This plots 30 points in each direction for a smoother surface.
- f) axes = framed Puts axes along the edges of a frame around the plot.
- **g)** orientation = [−50, 60] Another nice viewing angle.

3. Plot $r = f(\theta, z)$ in cylindrical coordinates using

$$ \text{plot3d} \left( f(\theta, z), \theta = \alpha..\beta, z = s..t, coords = \text{cylindrical} \right). $$

To plot $z = g(r, \theta)$ use

$$ \text{plot3d} \left( [r, \theta, g(r, \theta)], \theta = \alpha..\beta, r = a..b, coords = \text{cylindrical} \right). $$

4. Plot $\rho = f(\theta, \phi)$ in spherical coordinates using

$$ \text{plot3d} \left( f(\theta, \phi), \theta = \alpha..\beta, \phi = \gamma..\delta, coords = \text{spherical} \right). $$

The optional equations listed above are also valid for cylindrical and spherical plots except for the three-directional grid equation for implicitplot3d in e). If there are only two free parameters for a 3d plot, then use a grid equation of the form grid = $[m, n]$ where m and n are positive integers.

Implicit plots can also be made in cylindrical or spherical coordinates. For example, to plot the equation $r^2 + 2z^2 = r \cos(\theta)$ in cylindrical coordinates use

$$ \text{implicitplot3d} \left( r^2 + 2z^2 = r \cos(\theta), r = a..b, \theta = \alpha..\beta, z = s..t, coords = \text{cylindrical} \right). $$