$z = Ax + By + C$

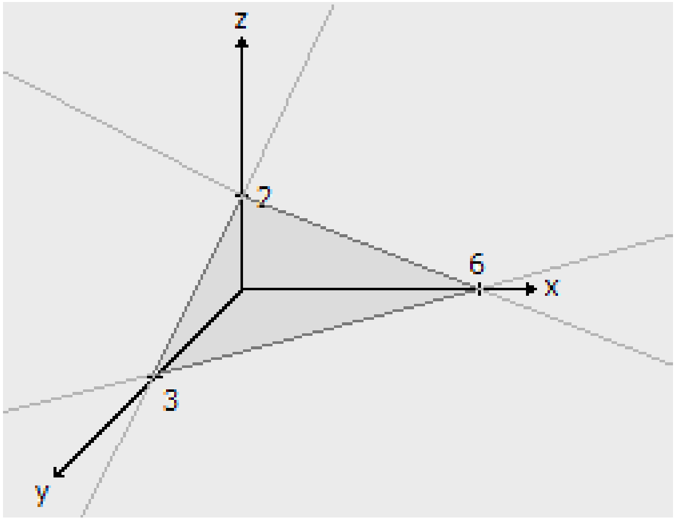
The graph of $z = Ax + By + C$ is a plane Π having a normal vector $\vec{n} = [-A, -B, 1]$ and passing through point $(0, 0, C)$. When plotting such a plane, it is more comfortable to express it in form $\Pi : \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ – then Π intersects the axes of the coordinate system at points $(a, 0, 0)$, $(0, b, 0)$ and $(0, 0, c)$.

Example 1. Draw the graph of $z = -\frac{x+2y-6}{3}$.

Solution:

$$z = -\frac{x+2y-6}{3}$$
$$-3z = x + 2y - 6$$
$$x + 2y + 3z = 6$$
$$\frac{x}{6} + \frac{y}{3} + \frac{z}{2} = 1$$

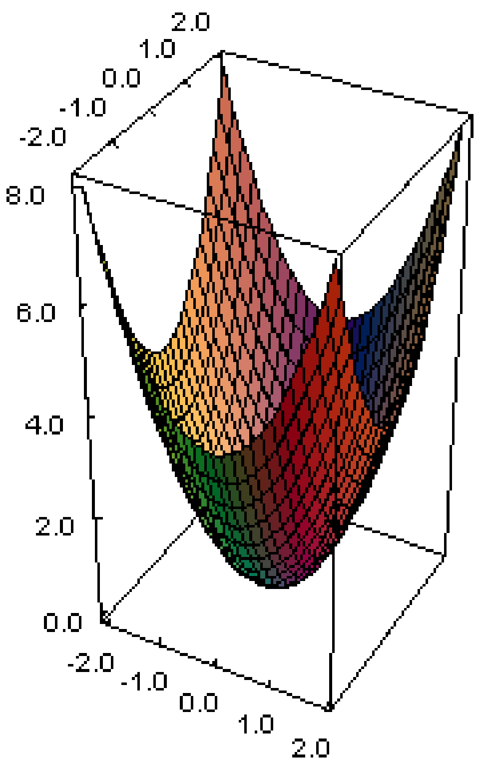
The graph of z is a plane intersecting the coordinate system axes at $(6, 0, 0)$, $(0, 3, 0)$ and $(0, 0, 2)$.



$z = A(x^2 + y^2)$

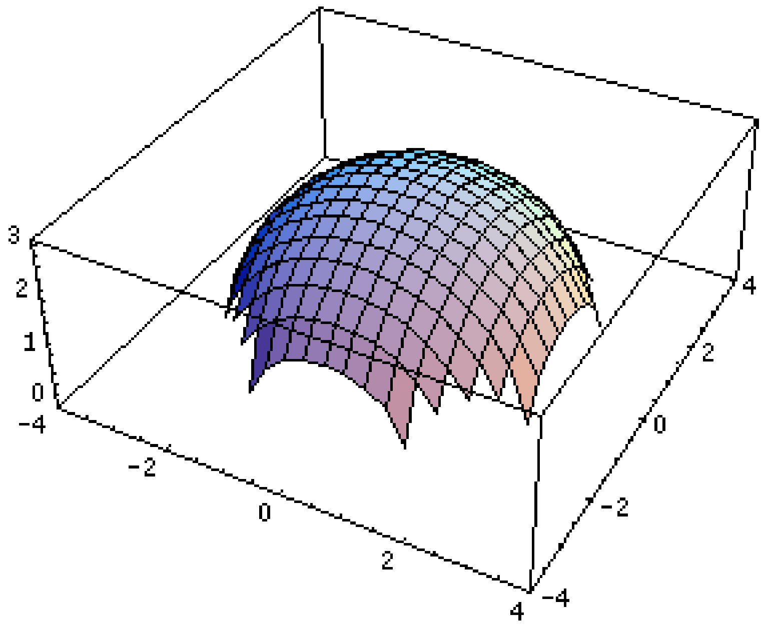
The graph of such a function is a paraboloid of revolution.

To obtain a graph of $z = A((x-p)^2 + (y-q)^2) + r$ you have to move the graph by a vector of $\vec{v} = [p, q, r]$.



$z = \sqrt{R^2 - ((x-a)^2 + (y-b)^2)} + c$

The graph of such a function is a hemisphere with a radius equal R and a center in (a, b, c).



$z = A\sqrt{x^2 + y^2}$

The graph of such a function is a conical surface that may also be obtained by revolving the graph of line $z_1 = kx, y = 0, x \geq 0$ about the OZ axis.