$$\frac{|ax_0 + by_0 + cz_0 + d|}{\sqrt{a^2 + b^2 + c^2}}$$

– distance from point $Q = (x_0, y_0, z_0)$ to plane $ax + by + cz + d = 0$

3D: $F(x,y,z)=0$

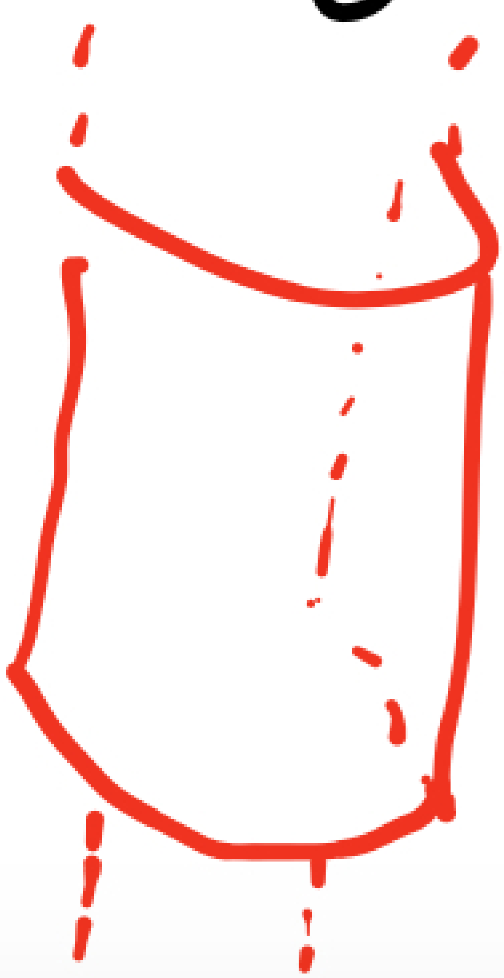
solution set

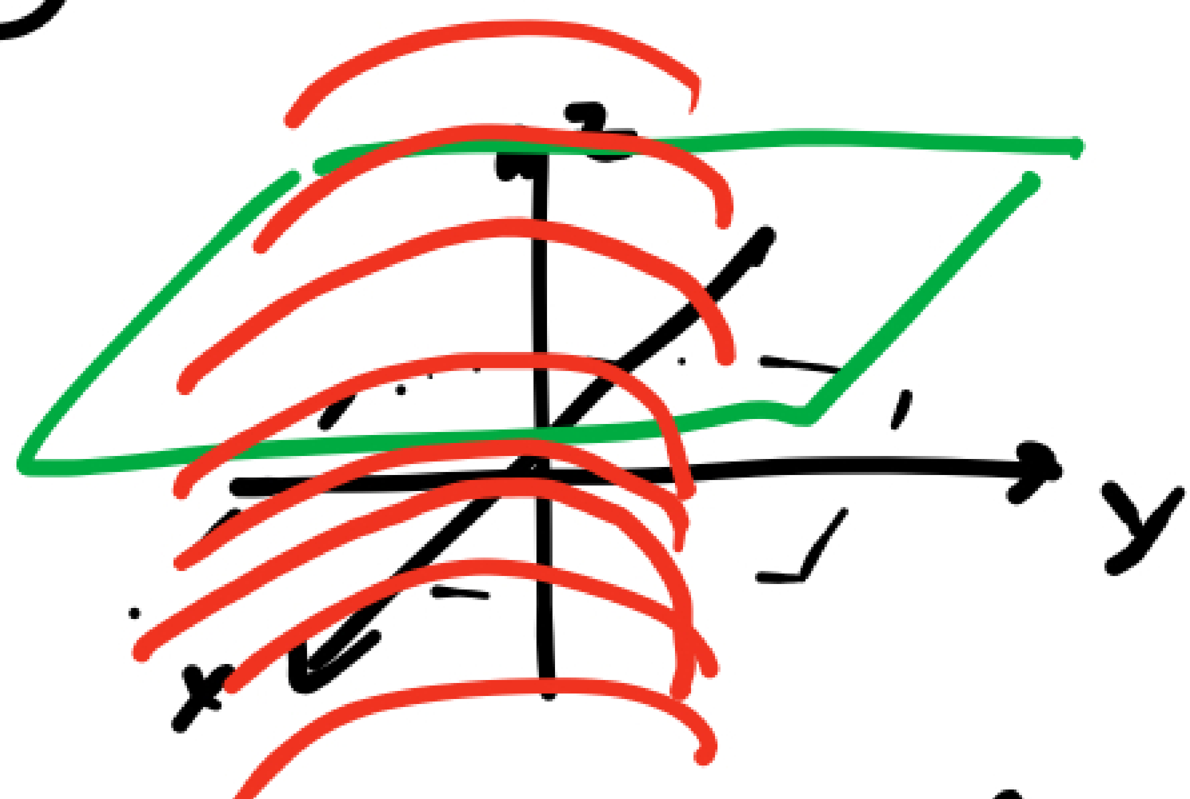
– surface

$ax+by+cz+d=0$

plane

$x-y^2=0$ z is free





"cylinders"

$$x^2 + y^2 + z^2 - 1 = 0$$

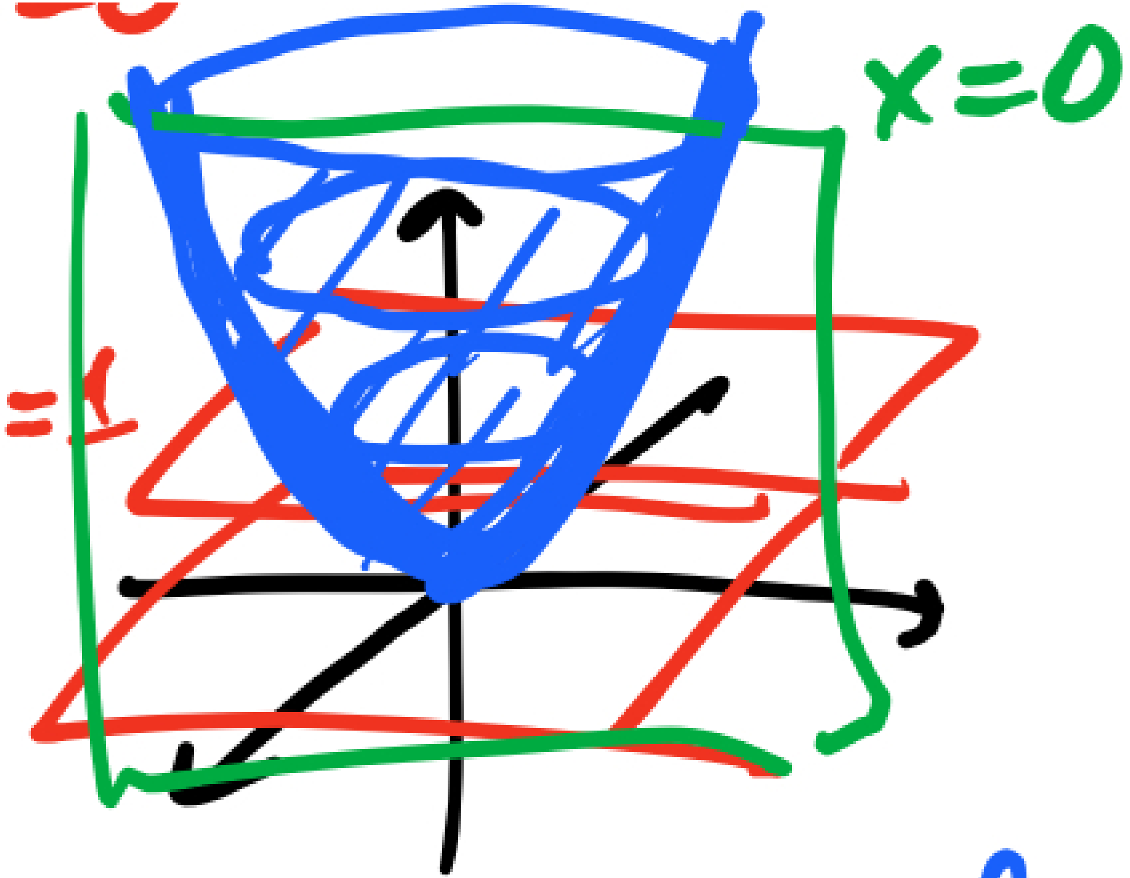
$$2x^2 + \frac{(y-1)^2}{2} + z^2 = 1$$

sphere

ellipsoid.

$$z = x^2 + y^2$$

$z = 0$



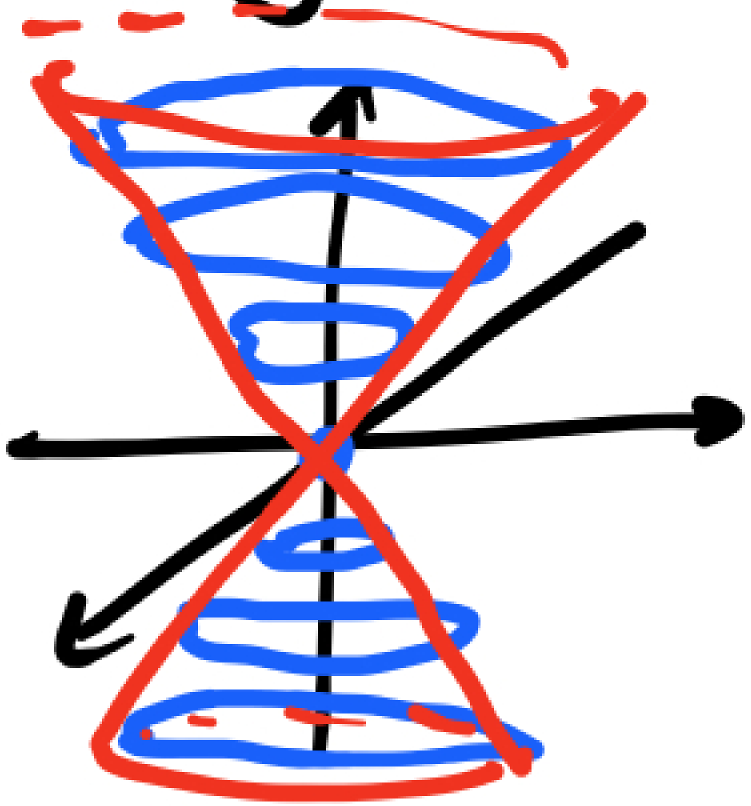
paraboloid

$z^2 = x^2 + y^2$

$z^2 = y^2$

$z = y$

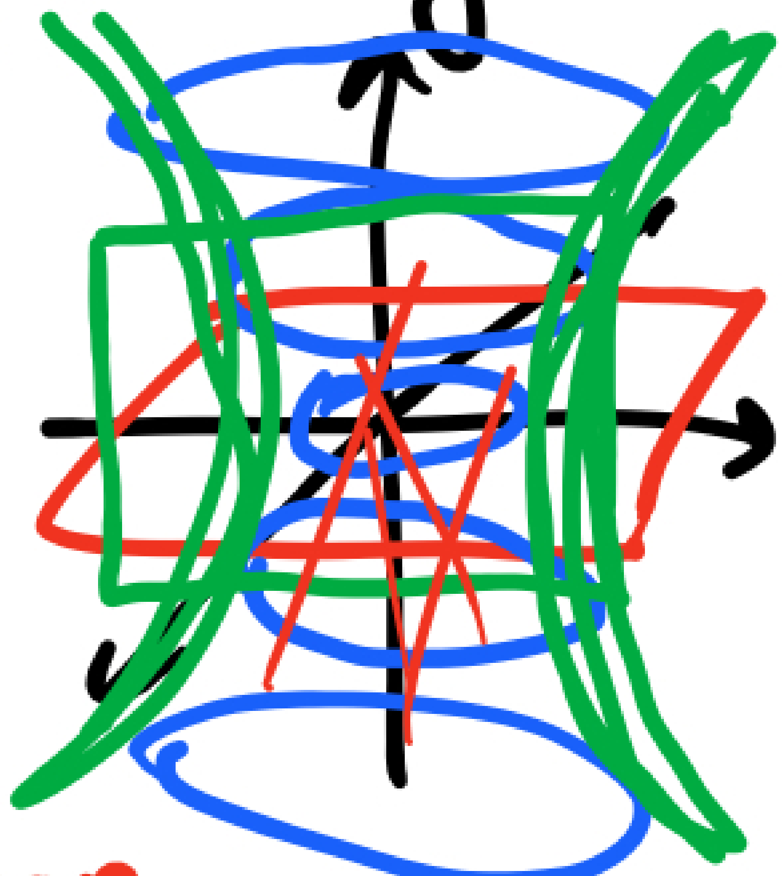
$z = -y$



a (double) cone.

$z^2 = x^2 + y^2 - 1$

$z=0$



$x=0$: $z^2 = y^2 - 1$

a hyperboloid (of one sheet)

[Shukhov tower]

Quadric surface is given by equation $F(x,y,z)=0$ where

$$F = Ax^2+By^2+Cz^2+Dxy+Exz + Fyz + Gx + Hy + Iz+J=0.$$

- by translations and rotations can be brought to one of the forms

- $Ax^2+By^2+Cz^2+D=0.$
- $Ax^2+By^2+Cz=0.$

What is left?

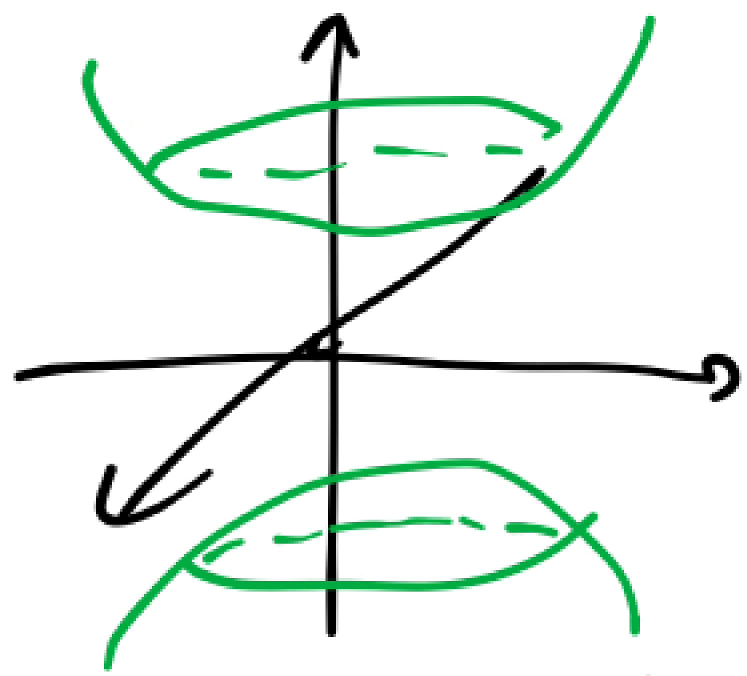
$z = 2x^2 + y^2$

elliptic paraboloid

$z = x^2 - y^2$

Exercise!

$z^2 = x^2 + y^2 + 1$



two-sheeted hyperboloid