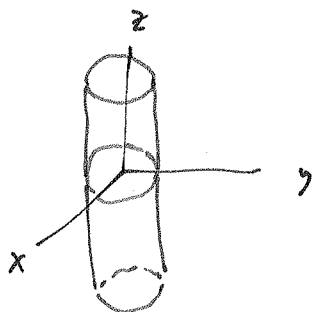


## §10.6. Quadratic Surfaces and Cylinders

To graph surfaces, we look at cross-sections called traces.  
The cross-sections are parallel to coordinate planes.

Ex.  $x^2 + y^2 = 1$

in  $xy$ -plane: circle  $z$  can be anything

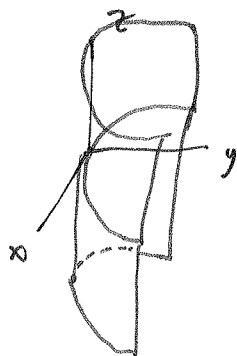


So we get an infinite right circular cylinder.

Ex.  $y^2 + z^2 = 1$

Ex.  $y = x^2$

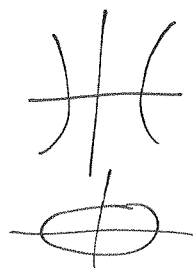
In  $xy$ -plane: parabola  $z$ : anything



This is also a "cylinder", but it's a parabolic one.

Other choices, like  $x^2 - y^2 = 1$

$$\frac{x^2}{2^2} + \frac{y^2}{1^2} = 1$$



## Quadratic Surfaces

Equations like  ~~$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} + \frac{(z-l)^2}{c^2} = 1$~~

~~$Ax^2 + By^2 + Cz^2 + Dx + Ey + Fz + D$~~   
all combos of 2<sup>nd</sup> order  $x, y, z$ 's.

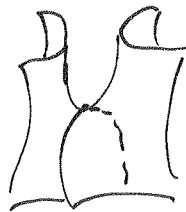
Ex.  $x^2 + y^2 + z^2 = r^2$

sphere of radius  $r$

Ex.  $x^2 + \frac{y^2}{9} + \frac{z^2}{4} = 1$  ellipsoid

Ex.  $z = 4x^2 + y^2$  elliptic-parabaloid

Ex.  $z = y^2 - x^2$  hyperbolic parabaloid or saddle surface



Table