

Lesson 9. Cylinders and Quadric Surfaces

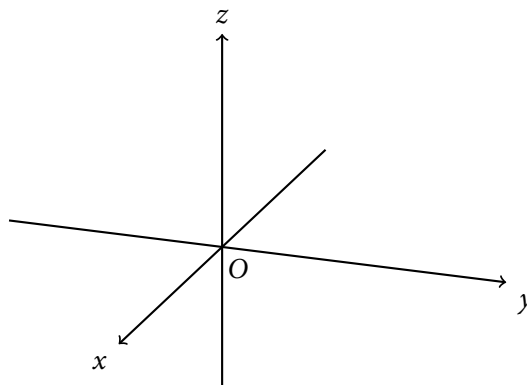
1 Today...

- Drawing different types of surfaces in 3D space

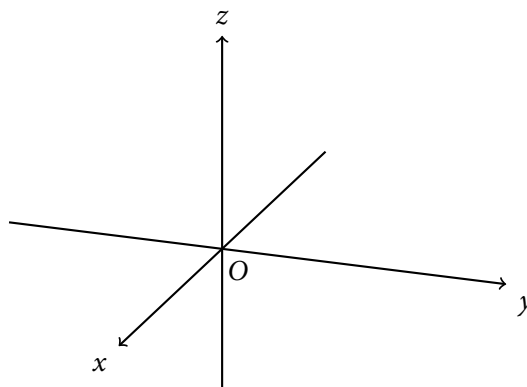
2 Cylinders

- A **cylinder** is a surface composed of all lines that
 - are parallel to a given line and
 - pass through a given plane curve
- In 3D, if one of the variables x , y , z is missing from the equation of a surface, then the surface is a cylinder

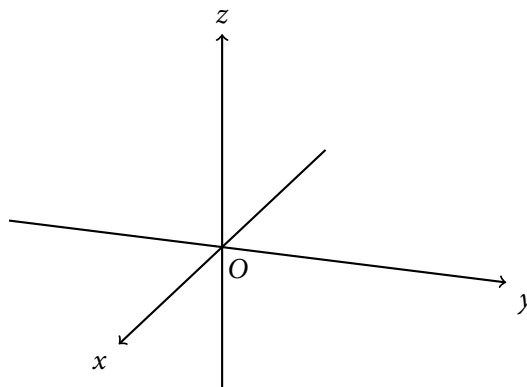
Example 1. Sketch the graph of the surface $z = x^2$.



Example 2. Sketch the graph of the surface $y^2 + z^2 = 1$.



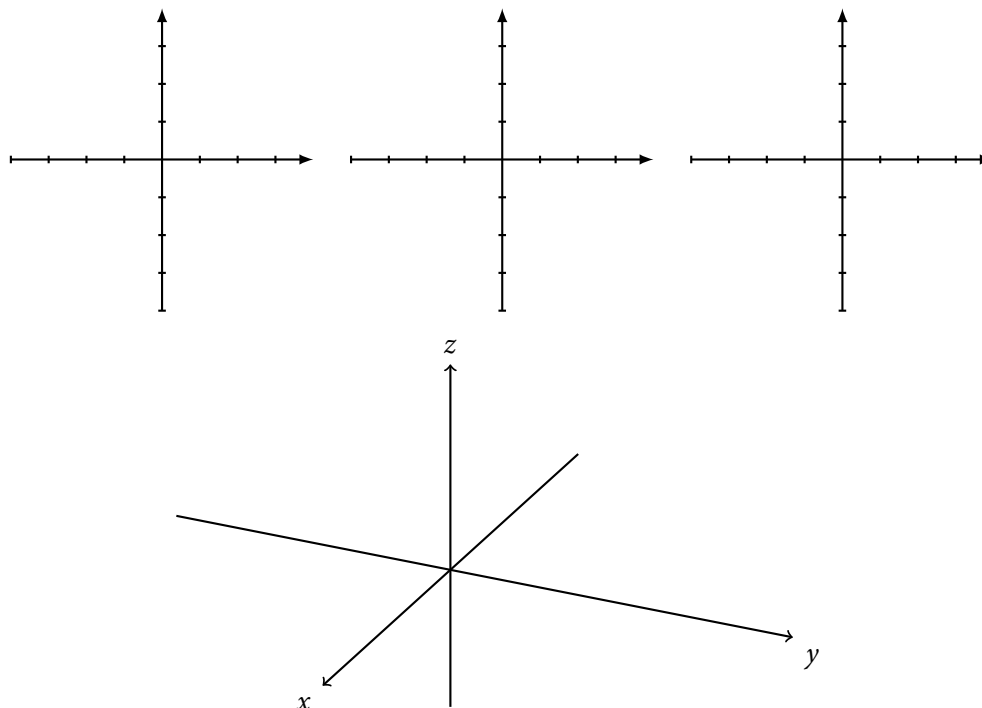
Example 3. Sketch the graph of the surface $xy = 1$.



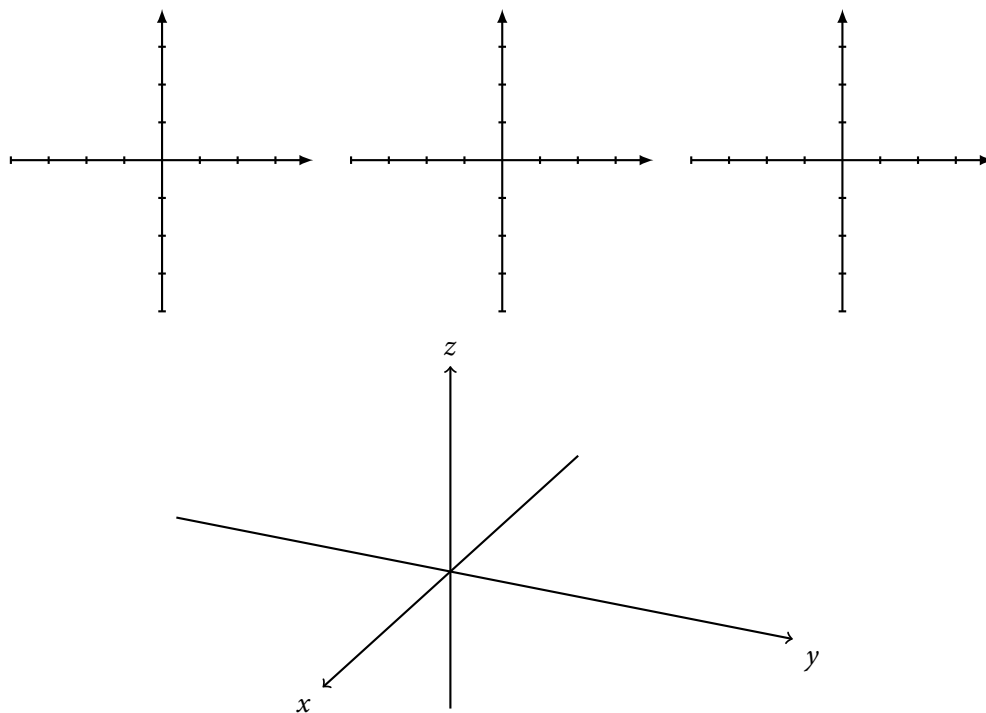
3 Traces

- A **trace** of a surface is the curve of intersection of the surface with planes parallel to the coordinate planes
- Idea:
 - Start with an equation in 3 variables x, y, z
 - Plug in a value for one of the variables
 - Graph the resulting equation in 2 variables (i.e., graph a trace of the surface)
 - Repeat for other values and other variables
 - “Glue” the traces together

Example 4. Use traces to sketch the equation $x^2 + \frac{y^2}{9} + \frac{z^2}{4} = 1$.



Example 5. Use traces to sketch the surface $z = 4x^2 + y^2$.



Example 6. Use traces to sketch the surface $z = y^2 - x^2$.

