12.1 Lecture Problems

13 Give geometric description of set of points satisfy $x^2 + y^2 = 4$, $z = y$

$x^2 + y^2 = 4$ is cylinder
$z = y$ is plane
> intersection is ellipse

---

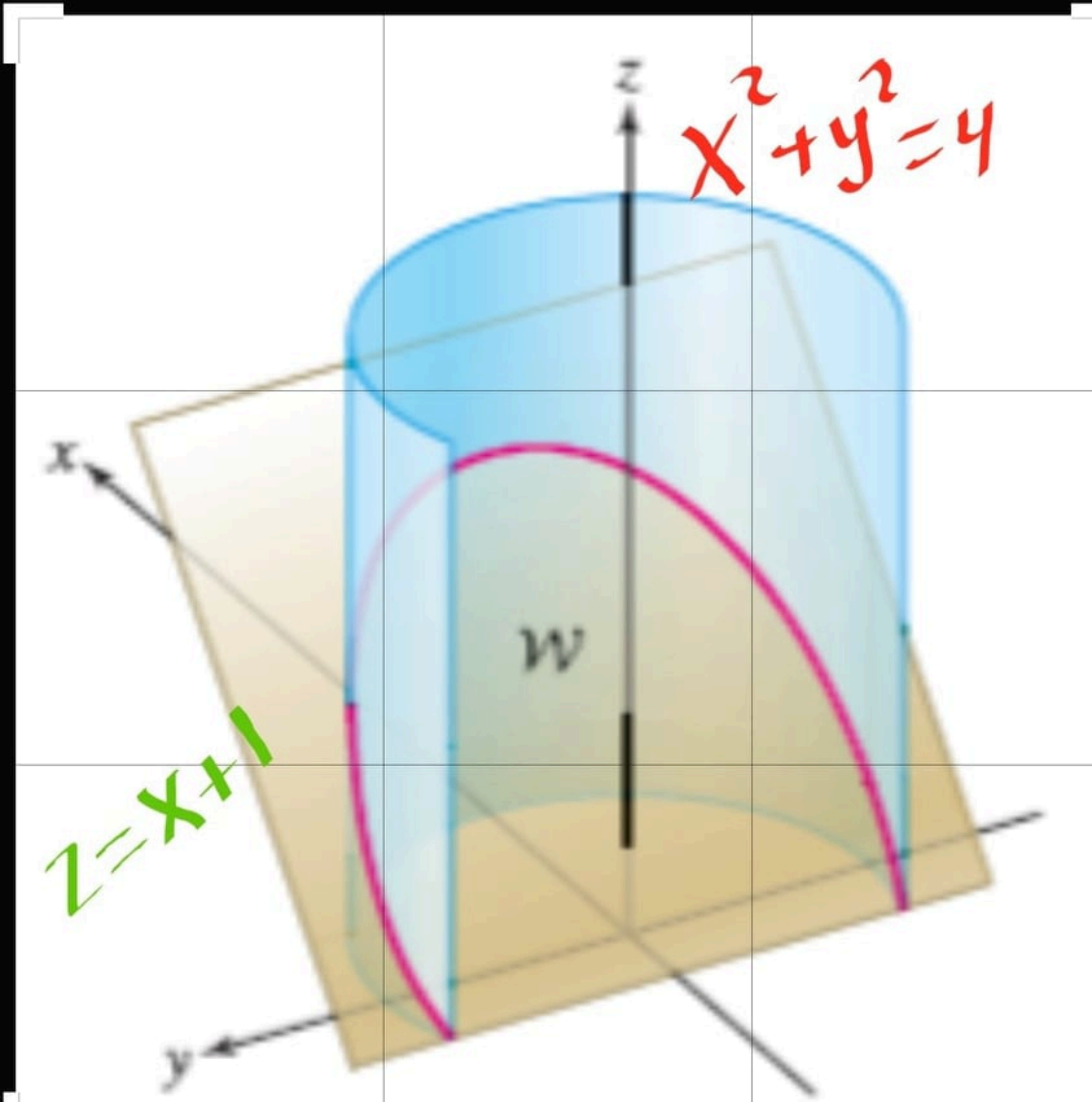
32 The set of points in space equidistant from the origin and the point $(0,2,0)$ are points (x,y,z) s.t

$$\sqrt{(x-0)^2+(y-0)^2+(z-0)^2} = \sqrt{(x-0)^2+(y-2)^2+(z-0)^2}$$

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

$$y^2 = y^2 - 4y + 4 \iff 4y = 4$$

$$\iff y = 1$$



34 The set of points in space that lie 2 units from the point $(0,0,1)$ and, at same time, 2 units from the point $(0,0,-1)$

$$\sqrt{(x-0)^2+(y-0)^2+(z-1)^2} = 2 \quad \longrightarrow (A)$$

and

$$\sqrt{(x-0)^2+(y-0)^2+(z-(-1))^2} = 2 \quad \longrightarrow (B)$$

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

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

$$-2z = 2z \Rightarrow 4z = 0 \Rightarrow z = 0$$

A) and B) become:

$$x^2 + y^2 + 1 = 4$$

$$x^2 + y^2 = 3$$