S T Q Q S S D

$x = r\cos\theta$
$\frac{x^2}{r^2} = \cos^2\theta$

___/___/___

1)a) S_1: $\boxed{x^2+y^2+z^2=9}$

S_2: $\rho = \frac{\cos\phi}{2\sin^2\phi} \Rightarrow 2\rho\sin^2\phi = \cos\phi$

$\Rightarrow 2\rho\sin^2\phi = \frac{z}{\rho} \Rightarrow 2\rho^2\sin^2\phi = z$

$\Rightarrow \frac{2x^2}{\cos^2\theta} = z \Rightarrow \frac{2\cancel{x^2}r^2}{\cancel{x^2}} = z$

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

1)b) S_1: $r^2+z^2=9$

S_2: $\Rightarrow 2\rho^2\sin^2\phi = z \Rightarrow 2(r^2+z^2)\sin^2\phi = z$

$\Rightarrow 2(r^2+z^2)(1-\cos^2\phi) = z$
$\Rightarrow 2(r^2+z^2) - 2\cancel{(r^2+z^2)}\left(\frac{z^2}{\cancel{r^2+z^2}}\right) = z$
$\Rightarrow 2r^2 + \cancel{2z^2} - \cancel{2z^2} = z$
$\Rightarrow \boxed{r^2 = \frac{z}{2}}$

1)c) S_1: interseções:

$xy \Rightarrow \begin{cases} x^2+y^2+z^2=9 \\ z=0 \end{cases} \Rightarrow x^2+y^2=9$

$xz \Rightarrow \begin{cases} x^2+y^2+z^2=9 \\ y=0 \end{cases} \Rightarrow x^2+z^2=9$

$zy \Rightarrow \begin{cases} x^2+y^2+z^2=9 \\ x=0 \end{cases} \Rightarrow y^2+z^2=9$

spiral

__/__/__ S T Q Q S S D

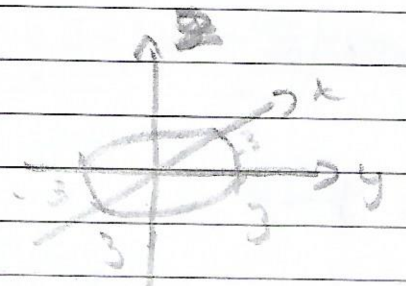
S_2: interseções:

xy: $\begin{cases} z - 2x^2 - 2y^2 = 0 \\ z = 0 \end{cases} \Rightarrow 2x^2 + 2y^2 = 0 \Rightarrow x^2 + y^2 = 0$

xz: $\begin{cases} z - 2x^2 - 2y^2 = 0 \\ y = 0 \end{cases} \Rightarrow 2x^2 = z$

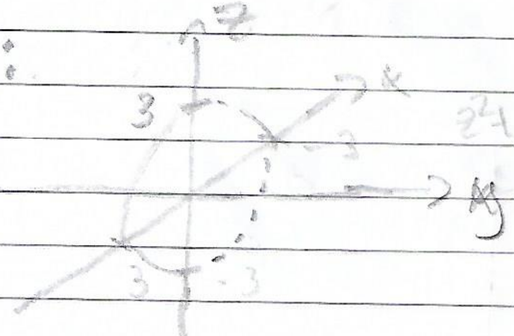
zy: $\begin{cases} z - 2x^2 - 2y^2 = 0 \\ x = 0 \end{cases} \Rightarrow 2y^2 = z$

S_1: xy:



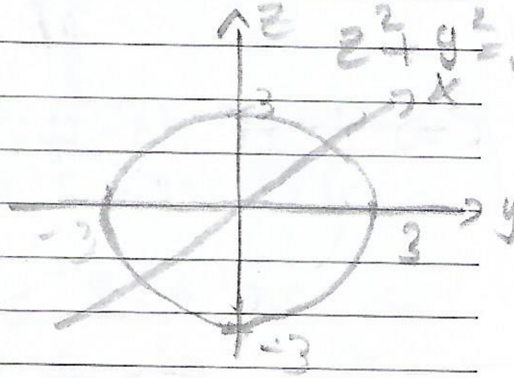
$x^2 + y^2 = 9$

xz:



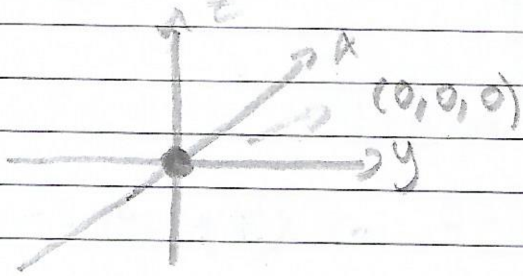
$z^2 + x^2 = 9$

yz:



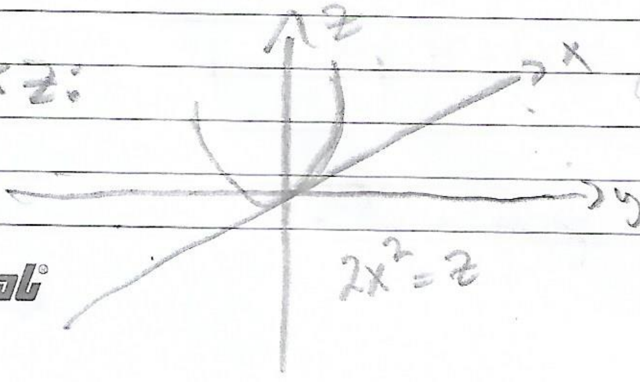
$z^2 + y^2 = 9$

S_2: xy:



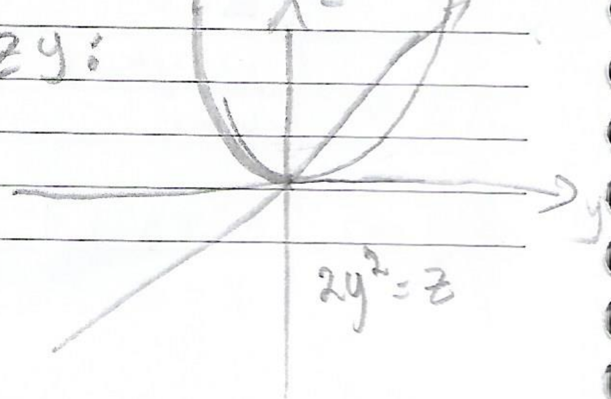
$(0,0,0)$ $x^2 + y^2 = 0$

xz:



$2x^2 = z$

zy:

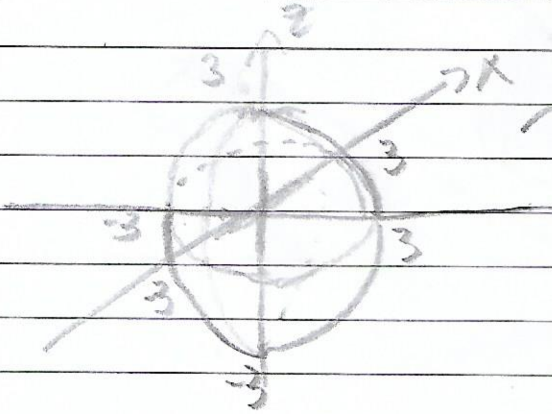


$2y^2 = z$

spiral

Superfícies:

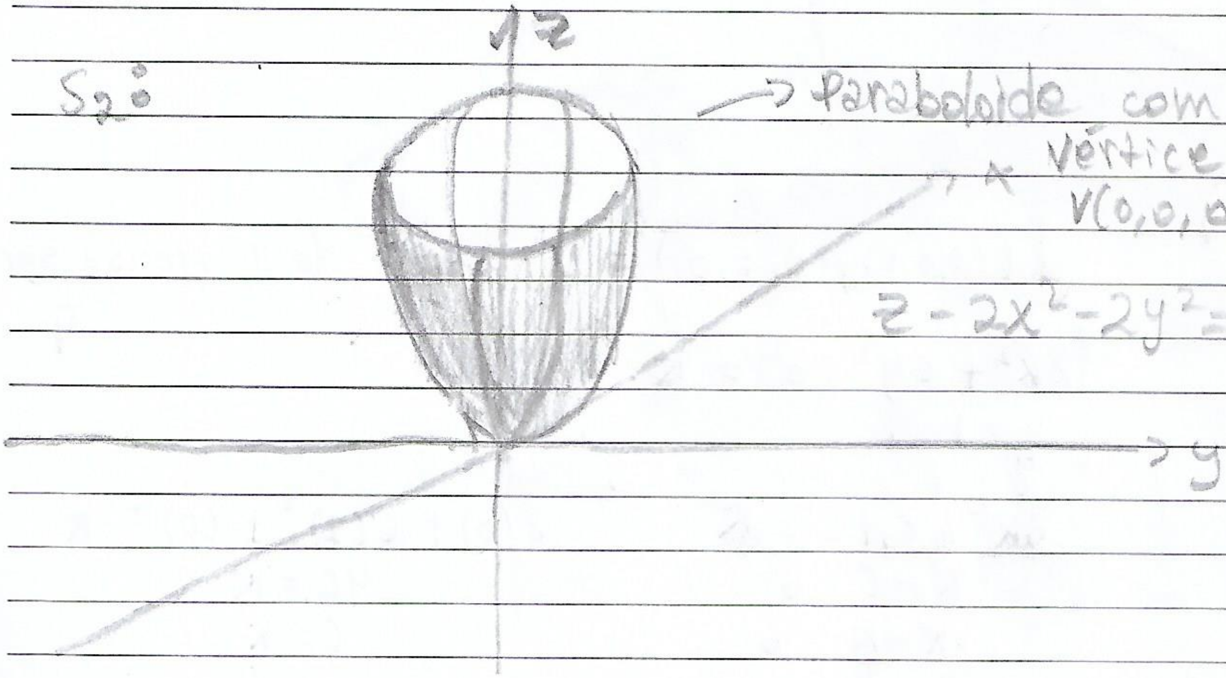
S_1:



→ esfera com raio = 3 e centro $C(0,0,0)$

$x^2+y^2+z^2=9$

S_2:



→ paraboloide com vértice $V(0,0,0)$

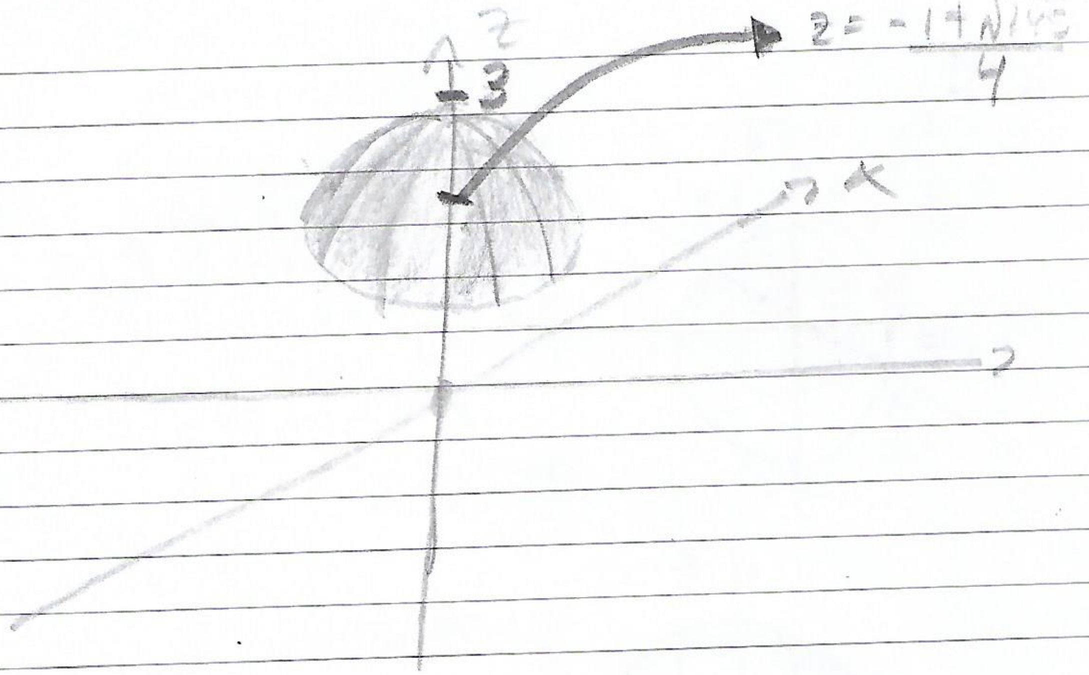
$z-2x^2-2y^2=0$

d) $\begin{cases} x^2+y^2+z^2=9 \ (1) \\ -2x^2-2y^2+z=0 \ (2) \end{cases}$ $2z^2+z=18$

$z=\dfrac{-1\pm\sqrt{1+8\cdot 18}}{4} \Rightarrow z=\dfrac{-1\pm\sqrt{145}}{4}$ → paraboloide não assume z negativo

$z=\dfrac{-1+\sqrt{145}}{4}$

$\Downarrow$



2)

$d((0,0,0),(0,2,0)) = 2 \rightarrow$ coef de y precisa ser $\frac{1}{4}$

$$\begin{cases} 8x^2 + cy^2 + z^2 = K \\ y = 1 \end{cases}$$

$$8x^2 + c + z^2 = K \qquad\qquad 8(0) + c(2)^2 + (0) = K$$

$$K - C = 6 \qquad\qquad 4c = K$$

$$\frac{4K}{4} - \frac{K}{4} = 6 \qquad\qquad C = \frac{K}{4}$$

$$K = \frac{24}{3} = 8 \rightarrow C = 2$$

$$\therefore \quad 8x^2 + 2y^2 + z^2 = 8$$

$$\Rightarrow \boxed{x^2 + \frac{y^2}{4} + \frac{z^2}{8} = 1}$$