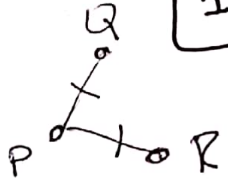
29 $Q(-4,3,1)$ $\quad R(4,3,1)$



$$\mathcal{C} = \{ P \in \mathbb{R}^3 \ / \ d(P,Q) = d(P,R) = 6 \}$$

Sea $P(x,y,z)$

- $d(P,Q) = |\overrightarrow{PQ}| = |(-4-x,\ 3-y,\ 1-z)| =$

$$= \sqrt{(4+x)^2 + (3-y)^2 + (1-z)^2} = 6 . \qquad (I)$$

- $d(P,R) = |\overrightarrow{PR}| = |(4-x,\ 3-y,\ 1-z)| =$

$$= \sqrt{(4-x)^2 + (3-y)^2 + (1-z)^2} = 6 . \qquad (II)$$

De (I) y (II)

$$\begin{cases} (4+x)^2 + (3-y)^2 + (1-z)^2 = 36 & (E_1) \\ (4-x)^2 + (3-y)^2 + (1-z)^2 = 36 & (E_2) \end{cases}$$

- De (E_1) $\ (3-y)^2 + (1-z)^2 = 36 - (4+x)^2$

- Reemplazamos en (E_2)

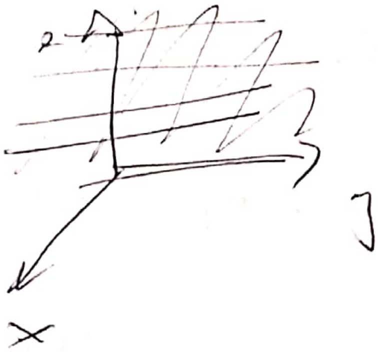
$$(4-x)^2 + \cancel{36} - (4+x)^2 = \cancel{36}$$

$$16 - 8x + x^2 - (16 + 8x + x^2) = 0 .$$

$$16-8x+x^2-(16+8x+x^2)=0.$$

$$\cancel{16}-8x+\cancel{x^2}-\cancel{16}-8x-\cancel{x^2}=0$$

$$-16x=0 \Rightarrow \boxed{x=0}$$



$\therefore$ Conclusión:

$P \in \mathcal{P}$, luego:

$$\mathcal{P}.\begin{cases} (4+x)^2+(3-y)^2+(z-1)^2=36. \\ (4-x)^2+(3-y)^2+(z-1)^2=36. \\ x=0. \end{cases}$$

Entonces.

$$\begin{cases} 4^2+(3-y)^2+(z-1)^2=36. \\ x=0. \end{cases} \Leftrightarrow$$

$$\Leftrightarrow \begin{cases} (3-y)^2+(z-1)^2=20 \\ x=0 \end{cases} \Leftrightarrow$$

$$\Leftrightarrow \begin{cases} (y-3)^2 + (z-1)^2 = 20 \\ x = 0. \end{cases}$$

$\mathcal{C}((0,3,1), \sqrt{20})$ circunferencia de $C(0,3,1)$; $r = \sqrt{20}$ contenida en el plano yz.

16 r_1 , r_2 rectas. $P_0 \in r_1$; $P_1 \in r_2$.

$u_1 \parallel r_1$; $u_2 \parallel r_2$

a) $r_1 \parallel r_2$

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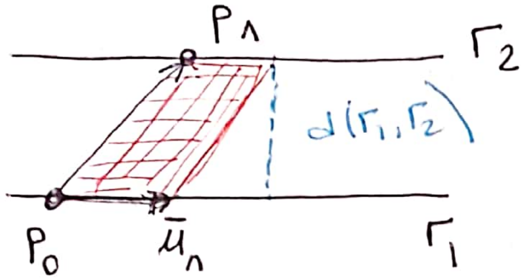


$$|\bar{u}_1 \wedge \overrightarrow{P_0P_1}| \rightarrow \text{área de paralelogramo.}$$

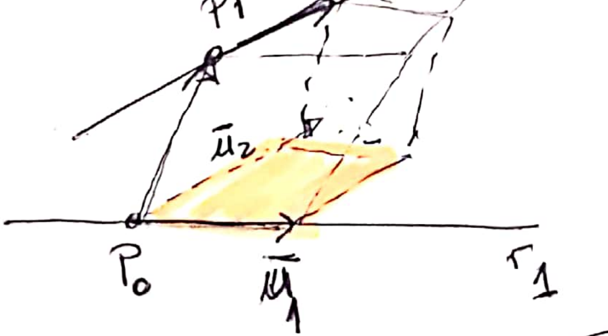
$$|\bar{u}_1 \wedge \overrightarrow{P_0P_1}| = b \cdot h.$$

$$\downarrow$$

$$|\vec{u}_1 \wedge \overrightarrow{P_0P_1}| = |\bar{u}_1| \cdot d(r_1, r_2)$$

$$\boxed{\therefore\ d(r_1, r_2) = \frac{|\bar{u}_1 \wedge \overrightarrow{P_0P_1}|}{|\bar{u}_1|}}$$

b) r_1, r_2 alabeadas.



$$|(u_1 \wedge u_2) \times \overrightarrow{P_0P_1}| = \text{volumen}$$

$$|(u_1 \wedge u_2) \times \overrightarrow{P_0P_1}| = \text{área de base} \cdot h$$

$$|(u_1 \wedge u_2) \times \overrightarrow{P_0P_1}| = |u_1 \wedge u_2| \cdot h.$$

$$\boxed{\frac{|(u_1 \wedge u_2) \times \overrightarrow{P_0P_1}|}{|u_1 \wedge u_2|} = d(r_1, r_2)}$$

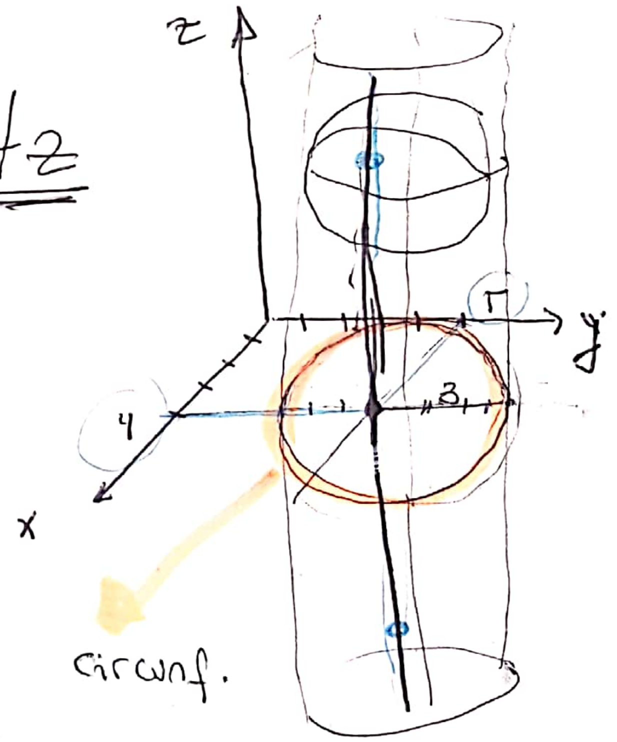
$\boxed{24}$ Ecuación de la sup. esférica $\mathcal{E}$:

f)

(I) • $\mathcal{E}$ esta inscripta en $(x-4)^2+(y-5)^2=9$

(II) • $C \in \pi$ donde $\pi)\ 3x+8y-8z=4$,

C centro de $\mathcal{E}$.



De (I)

$(x-4)^2+(y-5)^2=9$ $\quad \forall z$

cilindro.

Como $\mathcal{E}$ esta inscripta en el cilindro, entonces $C \in$ eje del cilindro. $\Rightarrow C(4,5,z)$ $\quad z$?

De II:

$C \in \pi \Rightarrow 3.4+8.5-8.z=4$

$12+40-4=8z$

$\boxed{6=z}$

$\boxed{\therefore C(4,5,6)}$

$\therefore (x-4)^2 + (y-5)^2 + (z-6)^2 = 9$

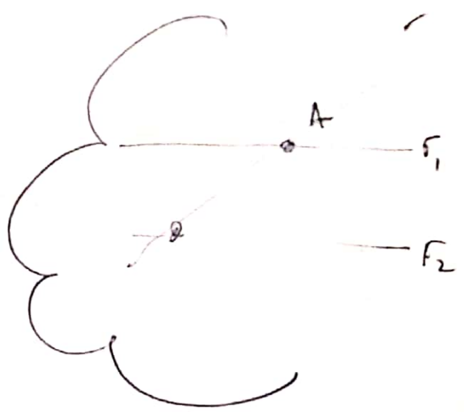
$\downarrow$

¡Ec. de la esfera!

$\boxed{20}$ r ? recta / $A(1,2,3) \in r$, $r \cap r_1 \neq \phi$

$r \cap r_2 \neq \phi$ donde $r_1)\ \frac{x}{2} = y-6 = \frac{z+3}{-4}$,

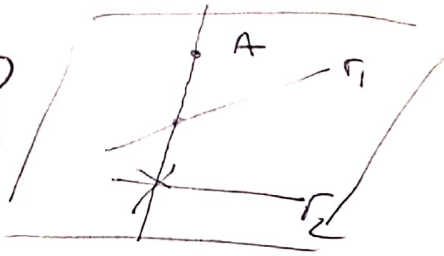
$r_2)\ \frac{x-12}{13} = y-3 = \frac{z+3}{-4}$.



Obs: ¿ $A \in r_1$? ¿ $A \in r_2$?

$A \notin r_1$; $A \notin r_2$.

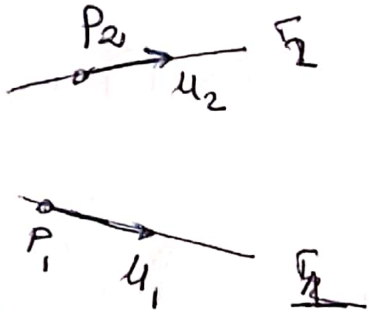
Obs2: ¿ r_1, r_2 son coplanares ?



- $\overline{u}_1 = (2,1,-4) \parallel r_1$; $P_1(0,6,-3) \in r_1$
- $\overline{u}_2 = (13,1,-4) \parallel r_2$, $P_2(12,3,-3) \in r_2$

r_1, r_2 sos coplanares $\Leftrightarrow$

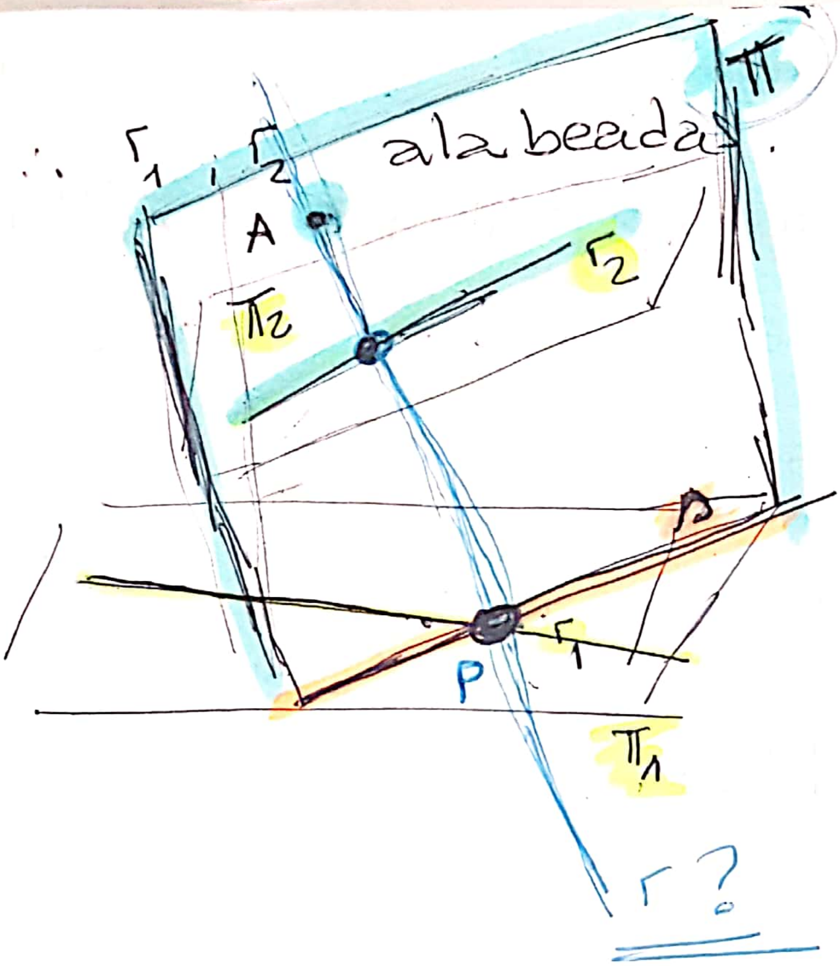
$\Leftrightarrow \overrightarrow{P_1P_2} \times (\overline{u}_1 \wedge \overline{u}_2) = 0$



$\overrightarrow{P_1P_2} = (12,-3,0)$

$\overline{u}_1 \wedge \overline{u}_2 = \begin{vmatrix} 2 & 1 & -4 \\ 13 & 1 & -4 \end{vmatrix} = (0,-44,-11)$ $\Longrightarrow$

$\Rightarrow (12,-3,0) \times (0,-44,-11) \neq 0$ $\therefore$ r_1, r_2 no son coplanares



Esquema:

1) Busco la ec. π / $A \in \pi \wedge r_2 \subset \pi$

2) $\pi \cap \pi_1 = s$. (recta s)

3) $s \cap r_1 = \{P\}$

4) $\overleftrightarrow{AP} = r$;

5) Verificar $r \cap r_2 \neq \emptyset$

∴ r es la recta buscada.