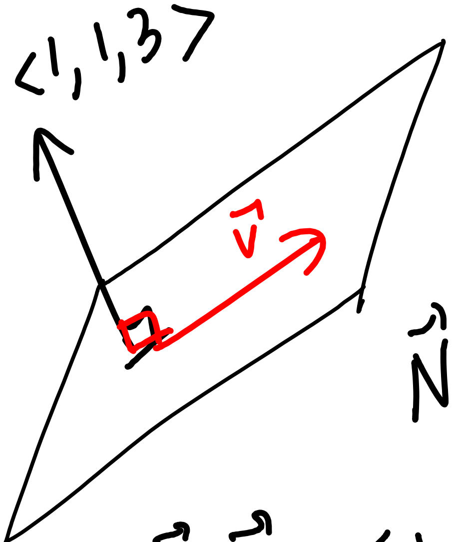
The vector $\vec{v} = \langle 1,2,-1 \rangle$ and the plane $x + y + 3z = 5$ are

1. parallel
2. perpendicular
3. neither

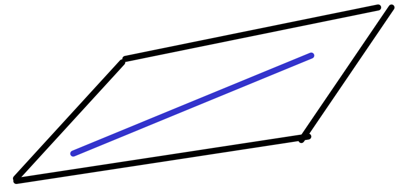


$$\vec{N} = \langle 1, 1, 3 \rangle$$

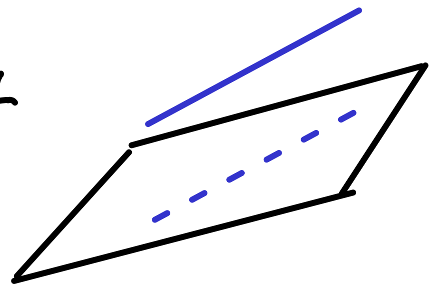
$$\vec{v} \cdot \vec{N} = \langle 1,2,-1 \rangle \cdot \langle 1,1,3 \rangle = 1 + 2 - 3 = 0.$$

A LINE AND A PLANE:

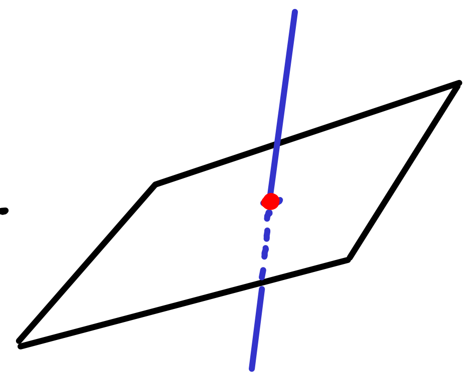
→ The line can be contained in the plane



→ or parallel to it



→ or intersects the plane in a point

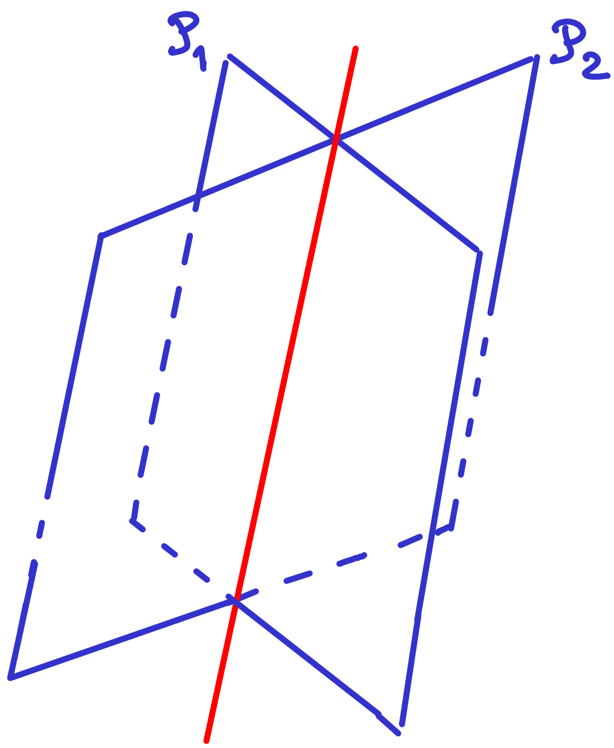


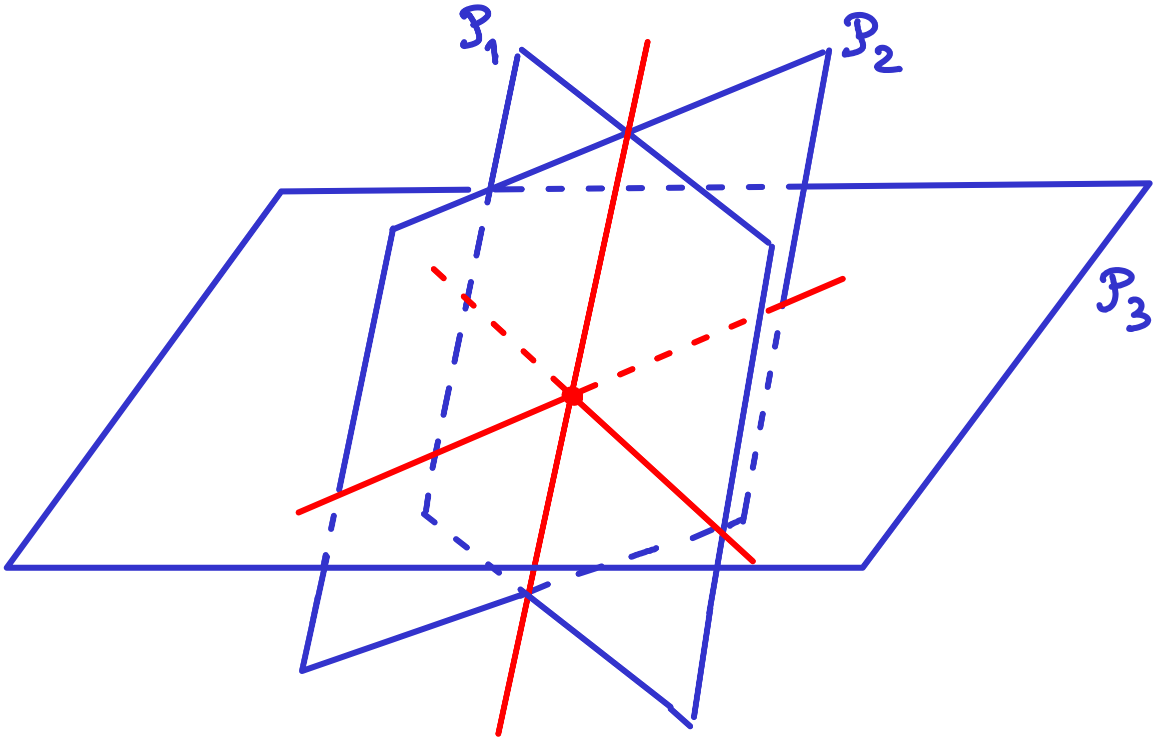
This has to do with: 3×3 linear systems!

$$\begin{cases} x+y+2z=7 & (\mathcal{P}_1) \\ 2x+y-z=4 & (\mathcal{P}_2) \\ x+2y+3z=3 & (\mathcal{P}_3) \end{cases}$$

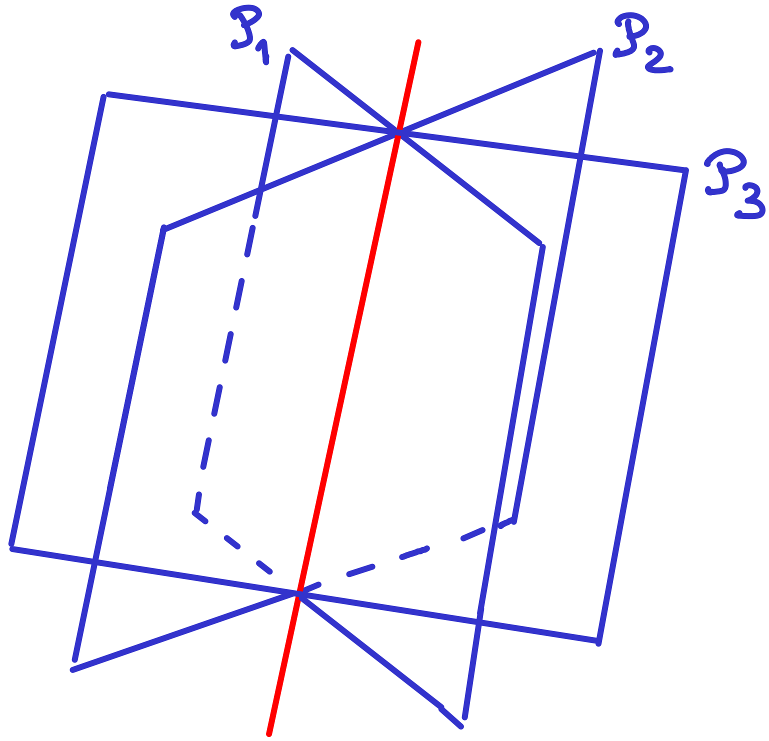
3 planes: where do they intersect?

If the first 2 planes are not parallel, they intersect in a <u>line</u>.





Line and $\mathcal{P}_3$
intersect in a point
(1 solution)

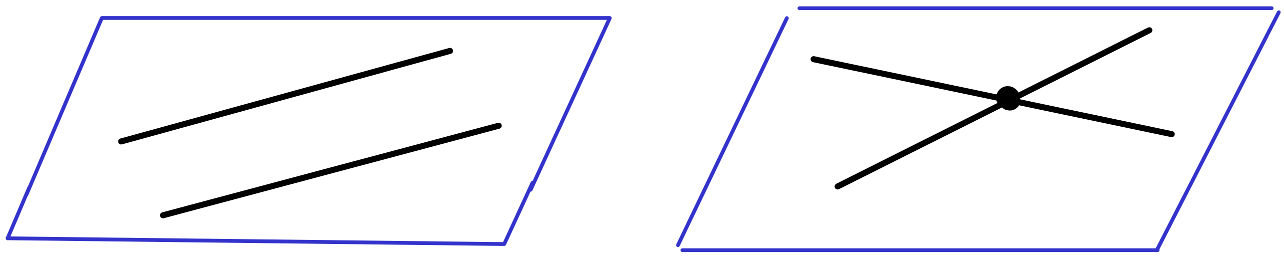


Line // $\mathcal{P}_3$
(no solution)
Line contained in $\mathcal{P}_3$
(∞ solutions)

RELATIVE POSITIONS OF 2 LINES:

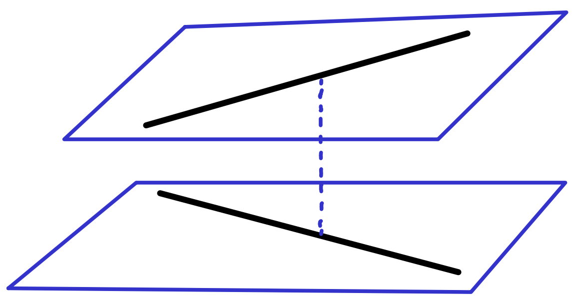
→ parallel
→ intersecting

} in both cases, a unique plane containing both lines



→ <u>skew lines</u> = neither parallel nor intersecting

Then they lie on parallel planes



Distance between the 2 planes = shortest distance between points on the skew lines.