Plane equations and normal vectors

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Give a normal to $3x-2y+z=7$. [2 marks]

Read the coefficients of x, y and z.

Answer: $(3,\ -2,\ 1)$

2. Find the plane through $(2,\ 0,\ -1)$ with normal $(1,\ 2,\ 3)$. [2 marks]

The constant is $2+0-3=-1$.

Use the normal coefficients.

Answer: $x+2y+3z=-1$

3. Find the plane through O spanned by $(1,\ 0,\ 1)$ and $(0,\ 1,\ 1)$. [2 marks]

A normal is $(-1,\ -1,\ 1)$.

Use zero constant and multiply by -1.

Answer: $x+y-z=0$

4. Are $2x-4y+6z=8$ and $x-2y+3z=4$ equivalent planes? [2 marks]

Divide every coefficient and the constant of the first by 2.

Answer: Yes.

5. Do O, $(1,\ 2,\ 3)$, $(2,\ 4,\ 6)$ determine a unique plane? [2 marks]

The points are collinear.

Infinitely many planes contain their common line.

Answer: No.

6. Parametrise the plane through $(1,\ 0,\ 2)$ with directions $(1,\ 1,\ 0)$, $(0,\ 1,\ 1)$. [2 marks]

Use both independent direction parameters.

The two directions are not parallel.

Answer: $\mathbf{r}=(1,\ 0,\ 2)+s(1,\ 1,\ 0)+t(0,\ 1,\ 1)$.