Line/plane intersections and angles

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Intersect $t(1,1,1)$ with x+y+z=6. [2 marks]

The plane equation gives 3t=6.

Substitute t=2.

Answer: $(2,2,2)$

2. Does (0,0,1)+t(1,0,0) meet z=0? [2 marks]

Its z coordinate remains 1.

It is a distinct parallel line.

Answer: No.

3. Find the smaller angle between x=0 and x+y=0. [2 marks]

Use normals (1,0,0) and (1,1,0).

Their smaller-angle cosine is $1/\sqrt{2}$.

Answer: 45°

4. Find the smaller angle of direction (0,0,1) with z=2. [2 marks]

The line direction is parallel to the plane normal.

It is perpendicular to the plane.

Answer: 90°

5. Find the intersection line of x+y=1 and z=2. [2 marks]

Set y=t.

Then x=1-t and z=2.

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

6. Find k so $(0, 0, k) + t(1, -1, 0)$ lies in x+y+z=3. [2 marks]

The direction contributes zero to x+y+z.

The initial point must satisfy the plane.

Answer: $k = 3$