

## 9E Points of Intersection

1. The lines  $l_1$  and  $l_2$  have vector equations:

$$\mathbf{r} = \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -2 \\ -1 \end{pmatrix}$$

and

$$\mathbf{r} = \begin{pmatrix} 0 \\ -2 \\ 3 \end{pmatrix} + \mu \begin{pmatrix} -5 \\ 1 \\ 4 \end{pmatrix}$$

Show that the lines intersect, and find their point of intersection.

2. Find the coordinates of the point of intersection of the line  $l$  and the plane  $\Pi$  where  $l$  has equation:

$$\mathbf{r} = -\mathbf{i} + \mathbf{j} - 5\mathbf{k} + \lambda(\mathbf{i} + \mathbf{j} + 2\mathbf{k})$$

And  $\Pi$  has equation:

$$\mathbf{r} \cdot (\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}) = 4$$

3. The lines  $l_1$  and  $l_2$  have equations:

$$\frac{x-2}{4} = \frac{y+3}{2} = z-1$$

and

$$\frac{x+1}{5} = \frac{y}{4} = \frac{z-4}{-2}$$

respectively.

Prove that  $l_1$  and  $l_2$  are skew.