9A Part 2 Cartesian 3D Lines

1. With respect to the fixed origin O, the line l is given by the equation:

$$\boldsymbol{r} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} + \lambda \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$$

Prove that a Cartesian form of the equation of l is:

$$\frac{x - a_1}{b_1} = \frac{y - a_2}{b_2} = \frac{z - a_3}{b_3}$$

2. Find a Cartesian equation of the line with equation:

$$\boldsymbol{r} = \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix} + \lambda \begin{pmatrix} -1 \\ 2 \\ 5 \end{pmatrix}$$

3. The line l has equation:

$$\boldsymbol{r} = \begin{pmatrix} -2 \\ 1 \\ 4 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$$

The point P has position vector:

$$\begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix}$$

a) Show that P does not line on l

b) Given that a circle, centre P, intersects l at points A and B, and that A has position vector:

$$A = \begin{pmatrix} 0 \\ -3 \\ 6 \end{pmatrix}$$

Find the position vector of B.