**9.** The plane $\Pi_1$ has vector equation

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

where $s$ and $t$ are scalar parameters.

(a) Determine a Cartesian equation for $\Pi_1$

**(3)**

The plane $\Pi_2$ has vector equation $\mathbf{r}.\begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix} = 1$

(b) Determine a vector equation for the line of intersection of $\Pi_1$ and $\Pi_2$

Give your answer in the form $\mathbf{r} = \mathbf{a} + \lambda\mathbf{b}$, where $\mathbf{a}$ and $\mathbf{b}$ are constant vectors and $\lambda$ is a scalar parameter.

**(4)**

The plane $\Pi_3$ has Cartesian equation $4x - 3y - z = 0$

(c) Use the answer to part (b) to determine the coordinates of the point of intersection of $\Pi_1$, $\Pi_2$ and $\Pi_3$

**(3)**

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**Question 9 continued**

**Question 9 continued**

**(Total for Question 9 is 10 marks)**

**TOTAL FOR PAPER IS 75 MARKS**

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