Question Number	Scheme	Notes	Marks
6(a)	$\mathbf{A}=\begin{pmatrix} p & 3 & -1 \\ 0 & 2 & -1 \\ 3 & -1 & 1 \end{pmatrix} \Rightarrow \mathbf{M}=\begin{pmatrix} 1 & 3 & -6 \\ 2 & p+3 & -p-9 \\ -1 & -p & 2p \end{pmatrix} \Rightarrow \mathbf{C}=\begin{pmatrix} 1 & -3 & -6 \\ -2 & p+3 & p+9 \\ -1 & p & 2p \end{pmatrix}$ Obtains the matrix of cofactors with **six** correct elements. This could be implied by a $\mathbf{C}^{\mathrm{T}}$ matrix with **six** correct elements, provided it is either labelled as $\mathbf{C}^{\mathrm{T}}$ or used correctly in $\frac{1}{\det \mathbf{A}}\mathbf{C}^{\mathrm{T}}$		**M1**
	$\det \mathbf{A} = p-3$	Correct simplified determinant	**B1**
	$\frac{1}{p-3}\begin{pmatrix} 1 & -2 & -1 \\ -3 & p+3 & p \\ -6 & p+9 & 2p \end{pmatrix}$ or e.g., $\begin{pmatrix} \frac{1}{p-3} & \frac{-2}{p-3} & \frac{-1}{p-3} \\ \frac{-3}{p-3} & \frac{p+3}{p-3} & \frac{p}{p-3} \\ \frac{-6}{p-3} & \frac{p+9}{p-3} & \frac{2p}{p-3} \end{pmatrix}$ **d**M1: Applies $\frac{1}{\det \mathbf{A}}\mathbf{C}^{\mathrm{T}}$ with their det **A** and **C** (condone one slip) A1: Fully correct inverse. ISW once a correct matrix inverse is seen, if simplified incorrectly **Note:** the correct answer written down scores all four marks in part (a)		**dM1 A1**
			(4)
(b)	$2p+3+5=16 \Rightarrow 2p=8 \Rightarrow p=4$ Or $\begin{pmatrix} 2 \\ 1 \\ -5 \end{pmatrix} = \begin{pmatrix} \frac{1}{p-3} & \frac{-2}{p-3} & \frac{-1}{p-3} \\ \frac{-3}{p-3} & \frac{p+3}{p-3} & \frac{p}{p-3} \\ \frac{-6}{p-3} & \frac{p+9}{p-3} & \frac{2p}{p-3} \end{pmatrix}\begin{pmatrix} 16 \\ 7 \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{2}{p-3} \\ \frac{7p-27}{p-3} \\ \frac{7p-33}{p-3} \end{pmatrix}$ $\Rightarrow 2=\frac{2}{p-3} \Rightarrow 2p-6=2 \Rightarrow p=4$	$p=4$ following any other correct equation (for example, equating elements from this matrix product etc)	**B1***
			(1)
(c)	$\begin{pmatrix} 1 & -2 & -1 \\ -3 & 7 & 4 \\ -6 & 13 & 8 \end{pmatrix}\begin{pmatrix} 2 \\ q \\ -1 \end{pmatrix} = \ldots$	Completes an attempt to multiply $\begin{pmatrix} 2 \\ q \\ -1 \end{pmatrix}$ by their inverse using $p=4$	**M1**
	$(-2q+3,\ 7q-10,\ 13q-20)$ or $x=-2q+3, \quad y=7q-10, \quad z=13q-20$	A1ft: **One correct and simplified ft their inverse** A1: Fully correct solution. No incorrect work. Accept as a PV.	**A1ft A1**
			(3)
			Total 8