6 Two vectors $\mathbf{u}$ and $\mathbf{v}$ are such that $\mathbf{u} = \begin{pmatrix} p^2 \\ -2 \\ 6 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 2 \\ p-1 \\ 2p+1 \end{pmatrix}$, where p is a constant.

(i) Find the values of p for which $\mathbf{u}$ is perpendicular to $\mathbf{v}$. [3]

(ii) For the case where $p = 1$, find the angle between the directions of $\mathbf{u}$ and $\mathbf{v}$. [4]