

7 Three points, O , A and B , are such that $\overrightarrow{OA} = \mathbf{i} + 3\mathbf{j} + p\mathbf{k}$ and $\overrightarrow{OB} = -7\mathbf{i} + (1 - p)\mathbf{j} + p\mathbf{k}$, where p is a constant.

(i) Find the values of p for which \overrightarrow{OA} is perpendicular to \overrightarrow{OB} . [3]

(ii) The magnitudes of \overrightarrow{OA} and \overrightarrow{OB} are a and b respectively. Find the value of p for which $b^2 = 2a^2$. [2]

(iii) Find the unit vector in the direction of \overrightarrow{AB} when $p = -8$. [3]