

**6** Relative to an origin  $O$ , the position vectors of the points  $A$  and  $B$  are given by

$$\overrightarrow{OA} = 2\mathbf{i} - 8\mathbf{j} + 4\mathbf{k} \quad \text{and} \quad \overrightarrow{OB} = 7\mathbf{i} + 2\mathbf{j} - \mathbf{k}.$$

(i) Find the value of  $\overrightarrow{OA} \cdot \overrightarrow{OB}$  and hence state whether angle  $AOB$  is acute, obtuse or a right angle. [3]

(ii) The point  $X$  is such that  $\overrightarrow{AX} = \frac{2}{5}\overrightarrow{AB}$ . Find the unit vector in the direction of  $OX$ . [4]