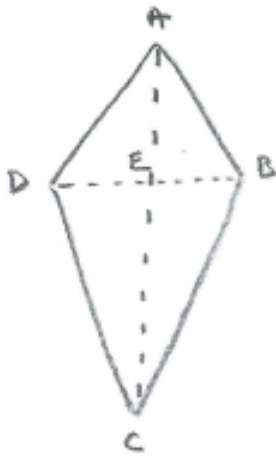


Vectors - Problems (2 pages; 13/8/19)

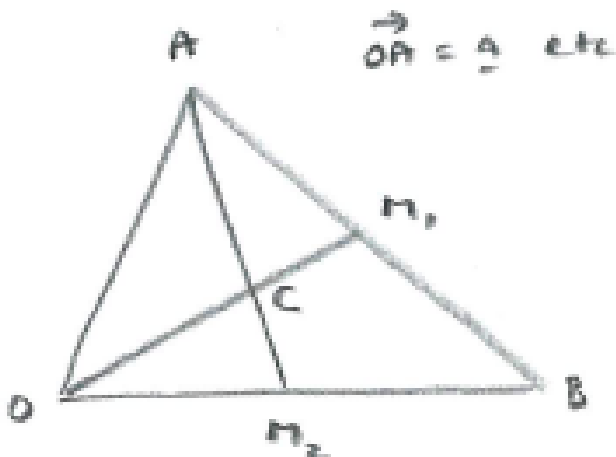
(1) [AEA, June 2009, Q7(d)]

In the diagram below, ABCD is a kite. Find \overrightarrow{OD} if $\overrightarrow{OA} = \begin{pmatrix} -1 \\ 4/3 \\ 7 \end{pmatrix}$,

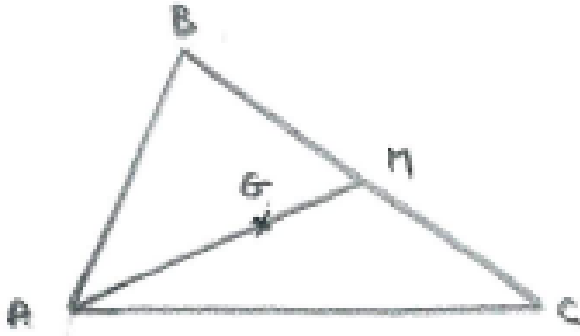
$$\overrightarrow{OB} = \begin{pmatrix} 4 \\ 4/3 \\ 2 \end{pmatrix} \quad \& \quad \overrightarrow{OC} = \begin{pmatrix} 6 \\ 16/3 \\ 2 \end{pmatrix}$$



(2) Prove that the centre of mass of a triangular lamina lies $2/3$ of the way along any of the medians.



(3) Given that the centre of mass of a triangular lamina lies $\frac{2}{3}$ of the way along any of the medians, prove that it has position vector $\frac{1}{3}(\underline{a} + \underline{b} + \underline{c})$.



(4) Show that if $|\underline{a} - \underline{b}| = |\underline{a} + \underline{b}|$, then \underline{a} & \underline{b} are perpendicular.

(5) Use vectors to prove that the mid-points of the sides of any quadrilateral form the vertices of a parallelogram.

(6) Find the angle between adjacent sloping faces of a right square-based pyramid, where the faces are equilateral triangles (as shown in Figure 1).

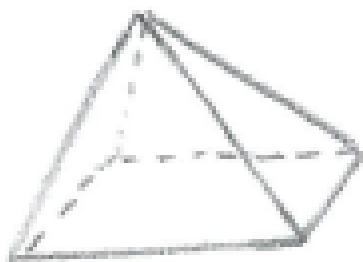


Figure 1