

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**[†]. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. (5 marks) Using vectors find the two points trisecting¹ the segment between $P(2, 3, 5)$ and $Q(8, -6, 2)$.

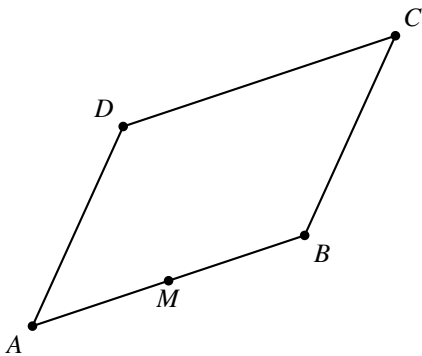
Question 2. (5 marks) A parallelogram has vertices A , B , C , and D in order. Given

$$A(1, -1, 2), \quad C(5, 3, 0),$$

and the midpoint

$$M(2, 0, 1)$$

of side AB , find the coordinates of the vertices B and D .



¹dividing something into three equal parts.

Question 3. (5 marks) If $\mathbf{u} = (0, 1, 1)$ and $\mathbf{v} = (p, 4, p)$, find the parameter p such that the angle between \mathbf{u} and \mathbf{v} is $\pi/3$.

Question 4. Given that $\|\mathbf{x}\| = 1$, $\|\mathbf{y}\| = 3$, and $\mathbf{x} \cdot \mathbf{y} = 2$, find

a. (2 marks) $4\mathbf{x} \cdot (\mathbf{y} - 2\mathbf{x})$

b. (3 marks) $\|\mathbf{x} + \mathbf{y}\|$