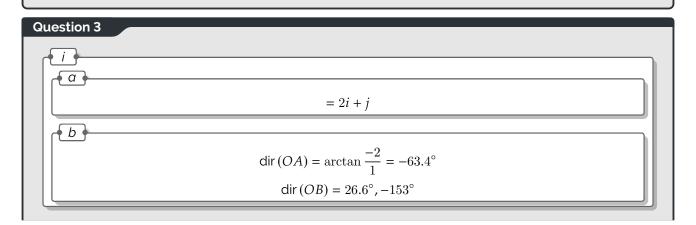
Vectors Exam Qs Jack Maguire

Question 1 p(2i+6j) + q(2i-4j) = 6i - 7j2pi + 6pj + 2qi - 4qj = 6i - 7j2p + 2q = 6 6p - 4q = -74p + 4q = 12 6p - 4q = -710p = 5 $p = \frac{1}{2}$ 2p + 2q = 61 + 2q = 62q = 5 $q = \frac{5}{2}$ $p = \frac{1}{2} \quad q = \frac{5}{2}$ ii ??? Will use algebra. $(2+2k)^2 + (6-4k)^2 = 25$ $4 + 8k + 4k^2 + 36 - 48k + 16k^2 = 25$ $20k^2 - 40k + 15 = 0$ $4k^2 - 8k + 3 = 0$ $k=\frac{1}{2},\frac{3}{2}$

Question 2 i 6i + 3j - 5i - 2j = ai + bj + 2i - j -i + 2j = ai + bj $D = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $M = \frac{\begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 6 \\ 3 \end{pmatrix}}{2}$ $= \begin{pmatrix} 4 \\ 4 \end{pmatrix}$ $AM = \begin{pmatrix} 4 \\ 4 \end{pmatrix} - \begin{pmatrix} -2 \\ 1 \end{pmatrix}$ $= \begin{pmatrix} 6 \\ 3 \end{pmatrix}$ $|AM| = \sqrt{6^2 + 3^2} = 6.71$



ii

C points form a circle around A, radius 2. You need to find the unit vector of A, then scale it by 2. Then, either add/subtract that from A to get the max/min.

$$|OA| = \sqrt{1^2 + 2^2} = \sqrt{5}$$

$$OA_{\text{Unit}} = \frac{OA}{\sqrt{5}}$$

$$= \frac{1}{\sqrt{5}}i - \frac{2}{\sqrt{5}}j$$

$$= \frac{\sqrt{5}}{5}i - \frac{2\sqrt{5}}{5}j$$

$$|AC| = \frac{2\sqrt{5}}{5}i - \frac{4\sqrt{5}}{5}j$$

$$\text{Max} = i - 2j + \frac{2\sqrt{5}}{5}i - \frac{4\sqrt{5}}{5}j$$
$$\text{Min} = i - 2j - \frac{2\sqrt{5}}{5}i + \frac{4\sqrt{5}}{5}j$$

Question 4

ii

$$|r| = \sqrt{4^2 + (-5)^2}$$
$$= 6.40$$
$$\theta = \arctan \frac{-5}{4}$$

$$\theta = \arctan \frac{3}{4}$$

iii

$$= \begin{pmatrix} 12 \\ -15 \end{pmatrix}$$

Question 5



$$|p| = \sqrt{8^2 + 1^2} = \sqrt{65}$$

$$|q| = \sqrt{4^2 + (-7)^2} = \sqrt{65}$$

ii

$$p+q = 8i + j + 4i - 7j$$
$$= 12i - 6j$$

$$\theta_{p+q} = \arctan \frac{-6}{12} = \arctan -\frac{1}{2}$$

$$\theta_{2i-j} = \arctan \frac{-1}{2} = \arctan -\frac{1}{2}$$

$$\theta_{2i-j} = \arctan \frac{-1}{2} = \arctan -\frac{1}{2}$$

Angles are the same \therefore they are parallel.

iii