FP1 Matrices Questions

$$A = \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$$

(ii)   Calculate the matrix product A^2. *(2 marks)*

(b)   The matrix **B** is defined by

$$B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$$

   (i)   Calculate $B^2 - A^2$. *(3 marks)*

   (ii)   Calculate $(B + A)(B - A)$. *(3 marks)*

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5   The matrix **M** is defined by

$$M = \begin{bmatrix} \dfrac{1}{\sqrt{2}} & \dfrac{1}{\sqrt{2}} \\ -\dfrac{1}{\sqrt{2}} & \dfrac{1}{\sqrt{2}} \end{bmatrix}$$

   (a)   Find the matrix:

       (i) M^2; *(3 marks)*

       (ii) M^4. *(1 mark)*

   (c)   Find the matrix M^{2006}. *(3 marks)*

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2   The matrices **A** and **B** are given by

$$A = \begin{bmatrix} \dfrac{\sqrt{3}}{2} & -\dfrac{1}{2} \\ \dfrac{1}{2} & \dfrac{\sqrt{3}}{2} \end{bmatrix}, \quad B = \begin{bmatrix} \dfrac{\sqrt{3}}{2} & \dfrac{1}{2} \\ \dfrac{1}{2} & -\dfrac{\sqrt{3}}{2} \end{bmatrix}$$

   (a)   Calculate:

       (i) $A + B$; *(2 marks)*

       (ii) BA. *(3 marks)*

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1   The matrices $\mathbf{A}$ and $\mathbf{B}$ are given by

$$\mathbf{A} = \begin{bmatrix} 2 & 1 \\ 3 & 8 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

The matrix $\mathbf{M} = \mathbf{A} - 2\mathbf{B}$.

(a)   Show that $\mathbf{M} = n \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$, where n is a positive integer.   *(2 marks)*

(c)   Show that

$$\mathbf{M}^2 = q\mathbf{I}$$

where q is an integer and $\mathbf{I}$ is the 2×2 identity matrix.   *(2 marks)*