

QQQ – Core Pure 1 – Chapter 6 – Matrices (Version 1)

Total Marks: 24

(24 = Platinum, 22 = Gold, 19 = Silver, 16 = Bronze)

1. The matrices **A** and **B** are given by

$$\mathbf{A} = \begin{bmatrix} 3 & 1 \\ 0 & 5 \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} 0 & 4 \\ 7 & 1 \end{bmatrix}$$

Calculate **AB**

Circle your answer.

[1 mark]

- $\begin{bmatrix} 3 & 5 \\ 7 & 6 \end{bmatrix}$
- $\begin{bmatrix} 0 & 20 \\ 21 & 12 \end{bmatrix}$
- $\begin{bmatrix} 0 & 4 \\ 0 & 5 \end{bmatrix}$
- $\begin{bmatrix} 7 & 13 \\ 35 & 5 \end{bmatrix}$

(Total 1 marks)

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2. Given that k is a real number and that

$$\mathbf{A} = \begin{pmatrix} 1+k & k \\ k & 1-k \end{pmatrix}$$

find the exact values of k for which **A** is a singular matrix. Give your answers in their simplest form.

(3)

(Total 3 marks)

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3.

$$\begin{pmatrix} x & 9 \\ y & z \end{pmatrix} - 3 \begin{pmatrix} z & y \\ z & y \end{pmatrix} = k\mathbf{I}$$

where x, y, z and k are constants.

Determine the value of x , the value of y and the value of z .

(4)

(Total 4 marks)

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4. The matrix $\mathbf{A}$ is given by

$$\mathbf{A} = \begin{bmatrix} 5 & 2 \\ -3 & 4 \end{bmatrix}$$

(a) Find $\det \mathbf{A}$

[1 mark]

(b) Find $\mathbf{A}^{-1}$

[1 mark]

(c) Given that $\mathbf{AB} = \begin{bmatrix} 9 & 6 \\ 5 & 12 \end{bmatrix}$ and $\mathbf{M} = 2\mathbf{A} + \mathbf{B}$ find the matrix $\mathbf{M}$

[3 marks]

(Total 5 marks)

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5.

$$\mathbf{M} = \begin{pmatrix} 2 & 1 & -3 \\ 4 & -2 & 1 \\ 3 & 5 & -2 \end{pmatrix}$$

(a) Find $\mathbf{M}^{-1}$ giving each element in exact form.

(2)

(b) Solve the simultaneous equations

$$2x + y - 3z = -4$$

$$4x - 2y + z = 9$$

$$3x + 5y - 2z = 5$$

(2)

(c) Interpret the answer to part (b) geometrically.

(1)

(Total 5 marks)

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6. The equations of three planes are

$$\begin{aligned}2x + y + 3z &= 3, \\3x - y - 2z &= 2, \\-4x + 3y + 7z &= k,\end{aligned}$$

where k is a constant.

- (a) By considering a suitable determinant, show that the planes do **not** meet at a single point. [2]
- (b) Given that the planes form a sheaf, determine the value of k . [4]

(Total 6 marks)