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VCE Specialist Mathematics ½

Matrices [4.1]

Test

23 Marks. 1 Minute Reading. 18 Minutes Writing.

Results:

Test Questions	_____ / 23

Section A: Test Questions (23 Marks)

Question 1 (3 marks)

Tick whether the following statements are **true** or **false**.

Statement	True	False
a. Only square matrices have a chance to be invertible.		
b. A $m \times n$ matrix can be multiplied by a $l \times n$ matrix, $n \neq l$ since they both have the same number of columns.		
c. For any two square matrices with the same dimensions, $A + B = B + A$ and $AB = BA$.		
d. If a square matrix A is invertible, then there exists another square matrix B such that $AB = BA$.		
e. You can only take the determinant of a square matrix.		
f. If A is invertible, and it is known that $AB = C$, then $B = A^{-1}C$ given that the dimensions of A, B and C allow for these multiplications to exist.		

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Question 2 (3 marks)

If $A = \begin{bmatrix} 3 & 2 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -4 \\ -2 & 8 \end{bmatrix}$, find the matrix X such that $\frac{2}{5}A^T + \frac{3}{2}X = B$.

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Question 3 (3 marks)

If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ and $A + A^T = I$, then find the value of α, $\alpha \in [0,\ \pi]$.

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Question 4 (2 marks)

$C = \begin{bmatrix} 1 & 6 \\ -2 & -2 \end{bmatrix}$ and $D = \begin{bmatrix} -5 & 10 \\ -4 & 8 \end{bmatrix}$.

For which matrix, C or D, does an inverse matrix **not** exist? Why?

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Question 5 (3 marks)

Consider

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 4 \\ -1 & -1 & 3 \end{bmatrix}$$

Find $det(A)$.

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Question 6 (5 marks)

If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then prove that $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ for any $n \in N$.

Hint: Use an induction proof.

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Question 7 (4 marks)

Solve the following systems of linear equations using matrices.

a. $\begin{matrix} x + 2y = 2 \\ 4x - 2y = 5 \end{matrix}$ (2 marks)

b. $\begin{matrix} 2x + 2y = 2 \\ 3x + 3y = 3 \end{matrix}$ (2 marks)

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