

VIRTUAL UNIVERSITY OF PAKISTAN

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Best of luck!



Question No : 1 of 26

Marks: 1 (Budgeted Time 1 Min)

$7x$ is an algebraic term in which 7 is a _____ and x is a _____.

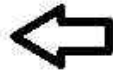
Answer (Please select your correct option)

☐ term, expression

☒ coefficient, variable

☐ variable, coefficient

☐ numerical, alphabet



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Question No : 2 of 26

Marks: 1 (Budgeted Time 1 Min)

$9x^2 + 3x + 4$ is _____

Answer (Please select your correct option)

☐ an equation

☐ a term

☐ an algebraic expression

☒ quadratic equation



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Question No : 3 of 26

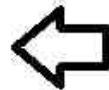
Marks: 1 (Budgeted Time 1 Min)

Which of the following is the coefficient matrix for the system

$$\begin{aligned}x_1 - 2x_2 + x_3 &= 0 \\ 2x_2 - 7x_3 &= 8 \\ -4x_1 + 3x_2 + 9x_3 &= -6\end{aligned}$$

Answer (Please select your correct option)

☐ $\begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -7 \\ -4 & 3 & 9 \end{bmatrix}$



☐ $\begin{bmatrix} 1 & -2 & 0 \\ 0 & 2 & 8 \\ -4 & 3 & 9 \end{bmatrix}$

☐ $\begin{bmatrix} 1 & 1 & 0 \\ 0 & -7 & 8 \\ -4 & 3 & 9 \end{bmatrix}$

☐ $\begin{bmatrix} 1 & 0 & -4 \\ -2 & 2 & 3 \\ -4 & 3 & 9 \end{bmatrix}$

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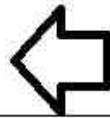
Question No : 4 of 26

Marks: 1 (Budgeted Time 1 Min)

Two simultaneous linear equations in two variables have no solution if their corresponding lines are _____.

Answer (Please select your correct option)

☐ parallel and distinct



☐ intersecting

☐ coincident

☐ perpendicular

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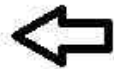
Question No : 5 of 26

Marks: 1 (Budgeted Time 1 Min)

If reduced echelon form of a linear system is $\begin{bmatrix} 1 & 0 & 5 & 5 \\ 0 & 1 & 1 & 6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ when free variable $x_3 = 0$, then which of the following is true for it?

Answer (Please select your correct option)

- ☐ The particular solution is $(0, 5, 6)$.
- ☐ The particular solution is $(6, 5, 0)$.
- ☐ The particular solution is $(5, 6, 0)$.
- ☐ The particular solution is $(0, 6, 5)$.



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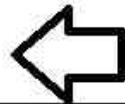
Question No : 6 of 26

Marks: 1 (Budgeted Time 1 Min)

If A is an $m \times n$ matrix and $Ax = b$ has a solution then which of the following is true?

Answer (Please select your correct option)

☐ A has a pivot position in every row.



☐ $\det(A) = 0$.

☐ Echelon form of A has at least one row of zeros.

☐ $b \notin \text{Span}\{a_1, a_2, \dots, a_n\}$.

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Question No : 7 of 26

Marks: 1 (Budgeted Time 1 Min)

If a homogeneous system $Ax = 0$ has a trivial solution, then which of the following is (are) the value(s) of the vector x ?

Answer (Please select your correct option)

-1

☐

0

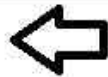
☒

1

☐

2

☐



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Question No : 8 of 26

Marks: 1 (Budgeted Time 1 Min)

If $T: R^n \rightarrow R^m$ be a linear transformation defined by $T(\vec{x}) = A\vec{x}$ (for all $\vec{x} \in R^n$), then which of the following is true for A ?

Answer (Please select your correct option)

☐ A is a singular matrix.

☐ A is a square matrix.

☒ A is a unique matrix.

☐ A is not a unique matrix.



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Which of the following is true for the linear operator L defined by $L \begin{pmatrix} a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} a_1 \\ -a_2 \end{pmatrix}$?

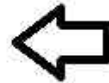
Answer (Please select your correct option)

☐ It is an enlargement by a negative scale factor.

☐ It is a shear.

☒ It is a reflection about X -axis.

☐ It is a reflection about Y -axis.



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If T be a transformation, then which of the following is true for its linearity?

Answer (Please select your correct option)

☐ $T(c\hat{u} + d\hat{v}) = c T(\hat{u}) + d T(\hat{v})$; where ' c ' and ' d ' are scalars

☐ $T(c\hat{u} \times d\hat{v}) = c T(\hat{u}) \times d T(\hat{v})$; where ' c ' and ' d ' are scalars

☐ $T(c\hat{u} \times d\hat{v}) = c T(\hat{u}) + d T(\hat{v})$; where ' c ' and ' d ' are scalars

☐ $T(c\hat{u} + d\hat{v}) = d T(\hat{u}) + c T(\hat{v})$; where ' c ' and ' d ' are scalars



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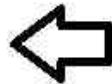
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If $A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1+1 & 2-1 \\ 2+2 & 4-1 \end{bmatrix}$, then which of the following is true for A and B ?

Answer (Please select your correct option)

- ☒ A and B are equal matrices.
- ☐ A is the transpose of B .
- ☐ B is the transpose of A .
- ☐ B is the multiplicative inverse of A .



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Question No : 12 of 26

Marks: 1 (Budgeted Time 1 Min)

What is the maximum possible number of pivots in a 6×6 matrix ?

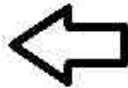
Answer (Please select your correct option)

☐ 2

☐ 4

☒ 6

☐ 0



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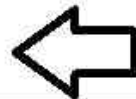
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If $A = \begin{bmatrix} P \\ Q \end{bmatrix}$ and $B = \begin{bmatrix} R & S \end{bmatrix}$ (where P, Q, R and S are square sub-matrices of same size), then which of the following is possible?

Answer (Please select your correct option)

- ☐ The product AB is defined but BA is not defined.
- ☐ The product AB is not defined but BA is defined.
- ☐ The product AB and BA both are not defined.
- ☐ The product AB and BA both are defined.



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Which of the following is true for the matrix $A = \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ O & A_{22} & A_{23} \\ O & O & A_{33} \end{bmatrix}$; where A_{11} , A_{22} and A_{33} are square sub-matrices, and ' O ' is a zero sub-matrix?

Answer (Please select your correct option)

☐ It is a block upper triangular matrix.



☐ It is a block lower triangular matrix.

☐ It is diagonal-constant matrix.

☐ It is a Null matrix.

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Question No : 15 of 26

Marks: 1 (Budgeted Time 1 Min)

If a matrix A is factorized into lower and upper triangular matrices , then which of the following is true for the matrix ?

Answer (Please select your correct option)

- ☐ It is called an LU -procedure.
- ☐ It is called an LU -decomposition.
- ☐ It is called an LU -matrices.
- ☐ It is called an LU -algorithm.



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Question No : 16 of 26

Marks: 1 (Budgeted Time 1 Min)

If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, then which of the following is the minor of entry a_{21} ?

Answer (Please select your correct option)

2

☐

3

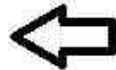
☒

4

☐

5

☐



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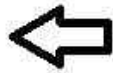
Question No : 17 of 26

Marks: 1 (Budgeted Time 1 Min)

Which of the following is true for the coefficient matrix in the Cramer's Rule ?

Answer (Please select your correct option)

- ☐ It must be invertible .
- ☐ It must be singular .
- ☐ It may or may not be invertible .
- ☐ It may or may not be non - singular .



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Question No : 18 of 26

Marks: 1 (Budgeted Time 1 Min)

If a set W be a subspace of a vector space V , then which of the following is NOT true for it ?

Answer (Please select your correct option)

- ☐ It must be closed under the scalar multiplication .
- ☐ It may or may not be closed under the operation of addition .
- ☐ It must have an additive inverse of each element .
- ☐ It must be commutative under the operation of addition .



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Question No : 19 of 26

Marks: 1 (Budgeted Time 1 Min)

If the set $V = \{0, 1, 2, 3\}$, then which of the following is true for it ?

option 3 or 4

Answer (Please select your correct option)

☐ It is closed under operation of addition .

☐ It is a vector space .

☐ It is commutative under operation of addition .

☐ It has an additive inverse of each element .

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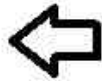
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If $c_1 \vec{v}_1 + c_2 \vec{v}_2 + c_3 \vec{v}_3 + \dots + c_p \vec{v}_p = 0$, and vectors $\vec{v}_1, \vec{v}_2, \vec{v}_3, \dots, \vec{v}_p$ all are linearly independent then which of the following is true ?

if dependent
then option 2

Answer (Please select your correct option)

☐ $c_1 = c_2 = c_3 = \dots = c_p = 0$



☐ $c_1 \neq c_2 \neq c_3 \neq \dots \neq c_p \neq 0$

☐ $c_1 \neq c_2 = c_3 = \dots = c_p \neq 0$

☐ $c_1 \neq c_2 = c_3 = \dots = c_p = 0$

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Question No : 21 of 26

Marks: 2 (Budgeted Time 4 Min)

If a matrix A is decomposed into $L = \begin{bmatrix} 2 & 0 \\ 3 & -1 \end{bmatrix}$ and $U = \begin{bmatrix} 1 & -7 \\ 0 & 1 \end{bmatrix}$ by LU factorization, then find A .

Answer ([Please click here to Add Answer](#))



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Question No : 22 of 26

Marks: 2 (Budgeted Time 4 Min)

If $A = \begin{bmatrix} 4 & 2 & 3 \\ 1 & 3 & 2 \end{bmatrix}$, then determine whether $\vec{u} = \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix}$ is in $Nul A$ or not?

Answer ([Please click here to Add Answer](#))



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Let W be the set of all vectors of the form $\begin{bmatrix} 3a \\ 2a \\ a \end{bmatrix}$. Find a vector $\vec{v}$ in R^3 such that $W = \text{Span}\{\vec{v}\}$.

Answer (Please [click here to Add Answer](#))



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Construct partitions of the following matrix into three 2×2 blocks :

$$B = \begin{bmatrix} 1 & 2 & 3 & 4 & 1 & 3 \\ 3 & 4 & 5 & 6 & 3 & 4 \end{bmatrix}$$

Answer (Please [click here to Add Answer](#))



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Question No : 25 of 26

Marks: 5 (Budgeted Time 10 Min)

Show that the coefficient matrix of the following linear system is strictly diagonally dominant. Also calculate the second iteration using Gauss – Seidel method if the first iteration is $(x_1^{(1)}, x_2^{(1)}, x_3^{(1)}) = (1.3, 1.04, 0.936)$.

$$10x_1 + 2x_2 + x_3 = 13$$

$$2x_1 + 10x_2 + x_3 = 13$$

$$2x_1 + x_2 + 10x_3 = 13$$

Answer (Please [click here to Add Answer](#))



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Question No : 26 of 26

Marks: 5 (Budgeted Time 10 Min)

Show that
$$\begin{vmatrix} a+h & a-h & d \\ b+k & b-k & e \\ c+l & c-l & f \end{vmatrix} = 2 \begin{vmatrix} a & a-h & d \\ b & b-k & e \\ c & c-l & f \end{vmatrix}.$$

Answer (Please [click here to Add Answer](#))



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