

**MIDTERM
EXAMINATION
Fall 2008
MTH501- Linear
Algebra (Session -
2)**

**Time: 60 min
Marks: 38**

Question No: 1 (Marks: 1) - Please choose one

If A

is a 2×2 matrix, the area of the parallelogram determined by the columns of A is

- ▶ A^{-1}
- ▶ **det A**
- ▶ adj A

Question No: 2 (Marks: 1) - Please choose one

Cramer's rule leads easily to a general formula for

- ▶ **the inverse of an $n \times n$ matrix A**
- ▶ the adjugate of an $n \times n$ matrix A
- ▶ the determinant of an $n \times n$ matrix A

Question No: 3 (Marks: 1) - Please choose one

matrix

- ▶ **diagonal matrix**

transpose of an upper triangular matrix is

- ▶ lower triangular matrix
- ▶ upper triangular

Question No: 4 (Marks: 1) - Please choose one

The

Let

A be a square matrix of order 3×3

with $\det(A) = 21$ and $\det(2A) =$

▶ **168**

▶ 186

▶ 21

Question No: 5 (Marks: 1) - Please choose one

A basis is a linearly independent set that is as large as possible.

► **True**

► False

Question No: 6 (Marks: 1) - Please choose one

Col A is all of $\mathbb{R}^m$ if and only if

► the equation $Ax = 0$ has a solution for each b in $\mathbb{R}^m$

► **the equation $Ax = b$ has a solution for each b in $\mathbb{R}^m$**

► the equation $Ax = b$ has a solution for a fixed b in $\mathbb{R}^m$.

Question No: 7 (Marks: 1) - Please choose one

If $A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$ and $B = \begin{bmatrix} B_1 \\ B_2 \end{bmatrix}$

, then the partitions of A and B

and

► are not conformable for block multiplication

► **are conformable for AB block multiplication**

► are not conformable for BA block multiplication

Question No: 8 (Marks: 1) - Please choose one

Two

vectors are linearly dependent if and only if they lie

▶ on a line parallel to x-axis

▶ **on a line through origin**

▶ on a line parallel to y-axis

Question No: 9 (Marks: 1) - Please choose one

The equation $x = p + t v$ describes a line

- ▶ through v parallel to p
- ▶ through p parallel to v
- ▶ **through origin parallel to p**

Question No: 10 (Marks: 1) - Please choose one

Let A be an $m \times n$ matrix. If for each b in $\mathbb{R}^m$ the equation $Ax=b$ has a solution then

- ▶ **A has pivot position in only one row**
- ▶ Columns of A span $\mathbb{R}^m$
- ▶ Rows of A span $\mathbb{R}^m$

Question No: 11 (Marks: 1) - Please choose one

$$x_1 - 2x_2 + x_3 = 8$$

$$2x_2 - 7x_3 = 0$$

$$-4x_1 + 3x_2 + 9x_3 = -6$$

Given the system

the augmented matrix for the system is

$$\begin{bmatrix} 1 & -2 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 2 & -7 \end{bmatrix}$$

$$\begin{bmatrix} & & \end{bmatrix}$$

$$\begin{bmatrix} -4 & 3 & 9 \end{bmatrix}$$

▶

$$\begin{bmatrix} 1 & -2 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 2 & -7 & 8 \end{bmatrix}$$

$$\begin{vmatrix} | & & & | \\ -4 & 3 & 9 & -6 \end{vmatrix}$$



$$\begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -8 \\ -4 & 5 & 9 \end{bmatrix}$$



$$\begin{bmatrix} 1 & -2 & 1 & 8 \\ 0 & 2 & -7 & 0 \\ -4 & 3 & 9 & -6 \end{bmatrix}$$

Question No: 12 (Marks: 1) - Please choose one

Consider the linear transformation T such that

$$\begin{bmatrix} 2 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

then T

$$\begin{bmatrix} 10 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

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

$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ is the matrix of linear transformation

$$\begin{bmatrix} 6 \\ 1 \end{bmatrix}$$



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Question No: 13 (Marks: 1) - Please choose one

$\begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{bmatrix}$	$\begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{bmatrix}$
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If then will be

- ▶ 15
- ▶ 45
- ▶ 135
- ▶ 60

Question No: 14 (Marks: 1) - Please choose one

For an $n \times n$ matrix $(A^t)^t =$

- ▶ A^t
- ▶ A
- ▶ A^{-1}
- ▶ $(A^{-1})^{-1}$

Question No: 15 (Marks: 1) - Please choose one

Each Linear Transformation T from R^n to R^m is equivalent to multiplication by a matrix A of order

- ▶ $m' n$

► $n'm$

► $n'n$

► m'm

Question No: 16 (Marks: 1) - Please choose one

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$$

Reduced echelon form of the matrix is

► $\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 1 \end{bmatrix}$

► $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix}$

► $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$

► $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix}$

Question No: 17 (Marks: 2)

Find vector and parametric equations of the plane that passes through the origin of $\mathbf{R}^3$ and is parallel to the vectors $\mathbf{v}_1 = (1, 2, 5)$ and $\mathbf{v}_2 = (5, 0, 4)$.

Question No: 18 (Marks: 2)

Which of the following is true? If V is a vector space over the field F .(justify your answer)

$$\{x + y / x \in V, y \in V\} = V$$

(a)

(b)

(c)

$$\{x + y \mid x \in V, y \in V\} = V \times V$$

$$\{\lambda v \mid v \in V, \lambda \in F\} = F \times V$$

Question No: 19 (Marks: 3)

Let

$$\begin{bmatrix} 1 \\ -2 \end{bmatrix} \quad \begin{bmatrix} h \end{bmatrix}$$

$$v = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, v = \begin{bmatrix} 1 \\ -3 \end{bmatrix}, \text{ and } y = \begin{bmatrix} -3 \end{bmatrix}.$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} -2 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 7 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} -5 \\ 1 \end{bmatrix}$$

For what value(s) of h is y in the plane generated by v_1 and

v_2 ?

Question No: 20 (Marks: 5)

With T defined by $T(x) = Ax$, find a vector x whose image under T is b , and determine whether x is unique.

$$\begin{bmatrix} 1 & -5 \end{bmatrix}$$

$$\begin{bmatrix} -7 \end{bmatrix}, b = \begin{bmatrix} -2 \end{bmatrix}$$

$$\begin{bmatrix} -3 \\ 7 \end{bmatrix} \quad \begin{bmatrix} 5 \\ -2 \end{bmatrix}$$

Question No: 21 (Marks: 10)

Given A and b , write the augmented matrix for the linear system that corresponds to the matrix equation $Ax = b$. Then solve the system and write the solution as a vector.

$$\begin{bmatrix} 1 & 2 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 0 \end{bmatrix}$$

$$A = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$$

$$\begin{pmatrix} -1 & 2 \end{pmatrix}$$

$$b = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 5 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 5 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 1 \end{pmatrix}$$

$$\begin{pmatrix} -1 \end{pmatrix}$$