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

The transpose of an upper triangular matrix is

- ▶ lower triangular matrix
- ▶ upper triangular matrix
- ▶ **diagonal matrix**

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

Let A be a square matrix of order 3×3 with $\det(A) = 21$, then $\det(2A) =$

- ▶ **168**
- ▶ 186
- ▶ 21

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► 126

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 $A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$ $B = \begin{bmatrix} B_1 \\ B_2 \end{bmatrix}$ and , then the partitions of A and B

► 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

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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 $\square^m$ the equation Ax=b has a solution then

- ► **A has pivot position in only one row**
- ► Columns of A span $\square^m$
- ► Rows of A span $\square^m$

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

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

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

▶

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

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

Consider the linear transformation T such that $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ is the matrix of linear transformation then $T \begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix}$ is

$$\begin{bmatrix} 10 \\ 4 \\ 2 \end{bmatrix}$$

▶

$$\begin{bmatrix} 1 \\ 0 \\ 9 \end{bmatrix}$$

▶

$$\begin{bmatrix} 10 \\ 4 \\ 1 \end{bmatrix}$$

▶

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

▶

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

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 5 \qquad \begin{vmatrix} a & b & c \\ 3d & 3e & 3f \\ g & h & i \end{vmatrix}$$

If then will be

▶ 15
▶ **45**
▶ 135
▶ 60

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

For an n×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

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▶ 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

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \end{bmatrix}$$

▶

$$\begin{bmatrix} 1 & 0 & 3 \\ 0 & 0 & 1 \end{bmatrix}$$

▶

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

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

▶

Question No: 17 (Marks: 2)

Find vector and parametric equations of the plane that passes through the origin of $\boldsymbol{R^3}$ and is parallel to the vectors $\boldsymbol{v_1} = (1, 2, 5)$ and $\boldsymbol{v_2} = (5, 0, 4)$.

Question No: 18 (Marks: 2)

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

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

(b) $\{x+y / x \in V, y \in V\} = V \times V$

(c) $\{\lambda v / v \in V, \lambda \in F\} = F \times V$

Question No: 19 (Marks: 3)

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Let

$$v_1 = \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix}, v_2 = \begin{bmatrix} -2 \\ 1 \\ 7 \end{bmatrix}, and\ y = \begin{bmatrix} h \\ -3 \\ -5 \end{bmatrix}.$$

For what value(s) of h is ***y*** in the plane generated by $\boldsymbol{v_1}$ and $\boldsymbol{v_2}$?

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.

$$\begin{bmatrix} 1 & -5 & -7 \\ -3 & 7 & 5 \end{bmatrix}, b = \begin{bmatrix} -2 \\ -2 \end{bmatrix}$$

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.

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

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