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MIDTERM PAPER (04-06-2016)

MTH501 (Linear Algebra)

Created by "Bint Ë Hawa"

Total marks 40

Objective: 20 marks (20 Mcq's)

Subjective: 20 marks (6 Questions)

ALL THE BEST!



Linear Algebra (MTH501)

Question: 1 (Marks: 1)

Which of the following is the simplified form of $-1[-1 \quad 2]+[2 \quad 3]$?

Choices:

- $[3 \quad -1]$
- $[-3 \quad 1]$
- $[3 \quad 1]$
- $[-3 \quad -1]$



Linear Algebra (MTH501)

Question: 2 (Marks: 1)

The solution of $Ax = b$ exists if and only if b can be written as a linear combination of _____ of A.

Choices:

- columns
- rows
- both columns and rows
- elements



Linear Algebra (MTH501)

Question: 3 (Marks: 1)

If $\vec{v}_1, \vec{v}_2$ and $\vec{v}_3$ are in R^m then which of the following is equivalent to

$$[v_1 \quad v_2 \quad v_3]\begin{bmatrix} 2 \\ -7 \\ 5 \end{bmatrix}$$

?

Choices:

- $2\vec{v}_1 - 7\vec{v}_2 + 5\vec{v}_3$
- $5\vec{v}_1 - 7\vec{v}_2 + 2\vec{v}_3$
- $5\vec{v}_1 + 2\vec{v}_2 - 7\vec{v}_3$
- $2\vec{v}_1 + 5\vec{v}_2 - 7\vec{v}_3$



Linear Algebra (MTH501)

Question: 4 (Marks: 1)

If $v_1=(2,2,2)$, $v_2=(0,0,3)$ and $v_3=(0,1,1)$ span R^3, then which of the following is true for any arbitrary $\vec{b}=(b_1,b_2,b_3)\in R^3$?

.....

Choices:

- $(0,1,1)=k_1(b_1,b_2,b_3)+k_2(2,2,2)+k_3(0,0,3)$

.....

- $(b_1,b_2,b_3)=k_1(2,2,2)+k_2(0,0,3)+k_3(0,1,1)$

.....

- $(0,0,3)=k_1(2,2,2)+k_2(b_1,b_2,b_3)+k_3(0,1,1)$

.....

- $(0,1,1)=k_1(2,2,2)+k_2(0,0,3)+k_3(b_1,b_2,b_3)$

.....



Linear Algebra (MTH501)

Question: 5 (Marks: 1)

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

Choices:

- -1
- 0
- 1
- 2



Linear Algebra (MTH501)

Question: 6 (Marks: 1)

If $\vec{v}_1=(2,1)$, $\vec{v}_2=(3,4)$ and $\vec{v}_3=(7,8)$ then which of the following is true?

.....

Choices:

- $\{\vec{v}_1,\vec{v}_2,\vec{v}_3\}$ is linearly dependent.

.....

- $\{\vec{v}_1,\vec{v}_2,\vec{v}_3\}$ is linearly independent.

.....

- The vector equation has trivial solution.

.....

- $\vec{v}_1=\frac{2}{3}\vec{v}_2$

.....



Linear Algebra (MTH501)

Question: 7 (Marks: 1)

If A be the standard matrix of linear transformation $T: R^n \to R^m$, then which of the following is true for the mapping from R^n onto R^m ?

Choices:

- The columns of A span R^n.
- The columns of A span R^m.
- The columns of A are linearly independent.
- The columns of A are identical.



Linear Algebra (MTH501)

Question: 8 (Marks: 1)

Since every linear transformation $T : R^n \to R^m$ is actually a matrix transformation , then which of the following is the alternate notation for the transformation ?

.....

Choices:

- $A\vec{x}$ a $\vec{x}$

.....

- $A\vec{x}$ a $T(\vec{x})$

.....

- $\vec{x}$ a $A\vec{x}$

.....

- $T(\vec{x})$ a $A\vec{x}$

.....



Linear Algebra (MTH501)

Question: 9 (Marks: 1)

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

.....

Choices:

- $T(c\vec{u} \text{ g } d\vec{v}) = c\,T(\vec{u}) \text{ g } d\,T(\vec{v})$; where c and d are scalars

.....

- $T(c\vec{u} + d\vec{v}) = c\,T(\vec{u}) + d\,T(\vec{v})$; where c and d are scalars

.....

- $T(c\vec{u} \times d\vec{v}) = c\,T(\vec{u}) \times d\,T(\vec{v})$; where c and d are scalars

.....

- $T(c\vec{u} + d\vec{v}) = d\,T(\vec{u}) + c\,T(\vec{v})$; where c and d are scalars

.....



Linear Algebra (MTH501)

Question: 10 (Marks: 1)

Which of the following is the most appropriate operation(s) for the linear transformation ?

.....

Choices:

- Scalar multiplication

  .....

- Vector addition and scalar multiplication

  .....

- Vector addition

  .....

- Vector and scalar multiplications



Linear Algebra (MTH501)

Question: 11 (Marks: 1)

$A=\begin{bmatrix}2 & 1\\ 4 & 3\end{bmatrix}$ $B=\begin{bmatrix}1+1 & 2-1\\ 2+2 & 4-1\end{bmatrix}$

If and , then which of the following is true for A and B ?

.....

Choices:

- (•) 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.

.....



Linear Algebra (MTH501)

Question: 12 (Marks: 1)

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

Which of the following is true for the matrix ?

Choices:

- It is a null matrix.
- It is a scalar matrix.
- It is a diagonal matrix.
- It is an identity matrix.



Linear Algebra (MTH501)

Question: 13 (Marks: 1)

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

Choices:

- 0
- 2
- 4
- 6

confirm it !



Linear Algebra (MTH501)

Question: 14 (Marks: 1)

If $A\vec{x} = \vec{b}$ and factorization of A is LU, then which of the following pair of equations can be used to solve $LU\vec{x} = \vec{b}$ for value of $\vec{x}$?

.....

Choices:

- $U\vec{x} = \vec{y}$ and $L\vec{y} = \vec{b}$

.....

- $L\vec{x} = \vec{y}$ and $U\vec{y} = \vec{b}$

.....

- $U\vec{b} = \vec{y}$ and $L\vec{y} = \vec{x}$

.....

- $L\vec{b} = \vec{y}$ and $U\vec{y} = \vec{x}$



Linear Algebra (MTH501)

Question: 15 (Marks: 1)

If a system of equations is solved using the Gauss-Seidel method , then which of the following is NOT true about the matrix M that is derived from the coefficient matrix ?

.....

Choices:

- All of its entries below the diagonal must be zero .



.....

- All of its entries above the diagonal must be zero .

.....

- Its determinant is non-zero .

.....

- It is an invertible matrix .



Linear Algebra (MTH501)

Question: 16 (Marks: 1)

$$A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & k & 1\end{bmatrix}$$

If , then which of the following is true for the matrix ?

Choices:

- $\det(A)=1$ confirm it !
- $\det(A)=k-1$
- $\det(A)=k$
- $\det(A)=k+1$



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Question: 17 (Marks: 1)

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

If , then which of the following is true for A ?

.....

Choices:

- $\det(A) = 1$

.....

- $\det(A) = -1$

.....

- $\det(A) = 0$

.....

- $\det(A) = \pm 1$



Linear Algebra (MTH501)

Question: 18 (Marks: 1)

$$A = \begin{bmatrix} 2 & 3 & 5 \\ 0 & 3 & 6 \\ 0 & 0 & 4 \end{bmatrix}$$

If , then which of the following is the value of $\det(A)$?

.....

Choices:

- 6

.....

- 18

.....

- 24

.....

- 36



Linear Algebra (MTH501)

Question: 19 (Marks: 1)

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

If the determinant of the matrix is -1 and the matrix B is obtained by adding 2 times of the second row in the first row of the matrix A, then which of the

Choices:

- Its determinant is -1 .
- Its determinant is 1 .
- Its determinant can not be evaluated .
- The information is not sufficient to calculate the determinant .



Linear Algebra (MTH501)

Question: 20 (Marks: 1)

$$A=\begin{bmatrix} 4 & 3 & 5 \\ 3 & 1 & 1 \\ 5 & 7 & 7 \end{bmatrix}$$

If the determinant of the matrix is 32 and the matrix B is obtained by multiplying any row of A with an integer value 4, then which of the following is true

Choices:

- Its determinant is 18.
- Its determinant is -32.
- Its determinant is 128.
- The information is not sufficient to calculate the determinant.



Linear Algebra (MTH501)

Question: 21 (Marks: 2)

If $A=\begin{bmatrix}2 & 1\\ 3 & 2\end{bmatrix}$ and $B=\begin{bmatrix}3\\ 2\end{bmatrix}$, then compute AB?

Linear Algebra (MTH501)

Question: 23 (Marks: 3)

If $A=\begin{bmatrix}2 & -4 & -3\\ 3 & 4 & -5\end{bmatrix}$ and $B=\begin{bmatrix}4 & -5 & -6\\ 2 & 7 & 10\end{bmatrix}$, then calculate $(A+B)^t$.

Linear Algebra (MTH501)

Question: 24 (Marks: 3)

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

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

Linear Algebra (MTH501)

Question: 25 (Marks: 5)

Show that the transformation $L:R^3\to R^2$ defined by $L(x,y,z)=(2y+z,x)$ is linear.



Linear Algebra (MTH501)

Question: 26 (Marks: 5)

$$A=\begin{bmatrix}2 & 3\\ 5 & 7\end{bmatrix}$$

Find an LU - decomposition of the matrix .

.....

Linear Algebra (MTH501)

Question: 22 (Marks: 2)

$$A=\left[\begin{array}{cc|cc}1 & 3 & 2 & 4\\ \hline 2 & 4 & 1 & 3\\ 5 & 3 & 2 & 4\\ \hline 9 & 8 & 6 & 5\end{array}\right] \qquad B=\begin{bmatrix}2 & 1\\ 1 & 3\\ 3 & 6\\ 4 & 5\end{bmatrix}$$

If , then make a partition of so that AB must be possible.