COURSE ON MATRICES

LESSON 1

Introduction to Matrices.

Basic Operations on Matrices.

HOMEWORK

Part 1: TEST

Select the correct answer (only one is true).

Question 1

A matrix is:

a) A mathematical operation on numbers
b) A rectangular table filled with numbers
c) A sequence of numbers (not necessarily integers)
d) A system of linear equations with a larger number of unknowns

Question 2

$$\begin{bmatrix} 3 & -7 & 1 \\ 2 & -10 & 5 \\ 1 & 3 & 8 \end{bmatrix}$$

The number **5** is an element of:

a) 2nd column and 3rd row
b) 3rd row and 3rd column
c) The sixth element
d) 2nd row and 3rd column

Question 3

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

What operation was performed on these matrices?

a) addition
b) subtraction
c) multiplication
d) impossible to determine

Question 4

$$\begin{bmatrix} -1 & 2 & 3 \\ 0 & 2 & -2 \\ 4 & 2 & 3 \end{bmatrix} + \begin{bmatrix} 3 & -2 & 3 \\ 0 & 1 & -3 \\ 5 & 5 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 6 \\ 0 & 3 & \boxed{?} \\ 9 & 7 & 4 \end{bmatrix}$$

Which number should be in the square with the question mark?

a) -5
b) 1
c) 5
d) 6

Question 5

$$-3 \cdot \begin{bmatrix} -1 & 2 & -3 & 0 \\ -4 & 2 & -5 & 5 \\ -1 & 4 & 4 & 8 \\ 2 & -3 & 2 & 5 \end{bmatrix} = \begin{bmatrix} \boxed{?} & -6 & 9 & 0 \\ 12 & -6 & 15 & -15 \\ 3 & -12 & -12 & -24 \\ -6 & 9 & -6 & -15 \end{bmatrix}$$

Which number should be in the square with the question mark?

a) -3
b) 3
c) -4
d) -2

Question 6

	$\begin{bmatrix} 4 & 3 \\ -1 & -5 \end{bmatrix}$
$\begin{bmatrix} -1 & 3 \\ -2 & -4 \\ 5 & 1 \end{bmatrix}$	$\begin{matrix} -7 & -18 \\ \boxed{?} & 14 \\ 19 & 10 \end{matrix}$

Which number should be in the square with the question mark?

a) -12
b) -4
c) 12
d) 4

Question 7

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

Is this operation feasible?

a) Impossible to determine
b) Yes
c) No

Question 8

How can we describe Matrix Transposition?

a) As multiplying the rows by the columns of a matrix
b) As an operation that is not always feasible
c) As an operation used to solve systems of linear equations
d) As swapping rows with columns

Question 9

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

Does this operation make sense?

a) Yes
b) No
c) Not always
d) Impossible to determine

Question 10

$$\underset{No.1}{\begin{bmatrix} -1 & 3 & 2 & 1 \end{bmatrix}} \quad \underset{No.2}{\begin{bmatrix} 1 & 0 & 0 \\ & 1 & 0 \\ & & 1 \end{bmatrix}} \quad \underset{No.3}{\begin{bmatrix} 0 \end{bmatrix}} \quad \underset{No.4}{\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}}$$

Which of the objects above is NOT a matrix?

a) No. 1
b) No. 2
c) No. 3
d) No. 4

Part 2: EXERCISES

Ex .1

Perform the operations:

1) $\begin{bmatrix} -1 & 2 & 5 \\ -2 & 3 & 3 \\ -1 & 4 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 3 & -1 \\ 5 & 5 & 8 \\ -4 & 2 & 7 \end{bmatrix} =$

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

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

4) $3\begin{bmatrix} -1 & 3 & 2 & 4 \\ 0 & 2 & 2 & 4 \end{bmatrix}^T - 2\begin{bmatrix} 2 & 5 \\ 8 & 2 \\ 4 & -1 \\ -2 & 0 \end{bmatrix} =$

5) $\begin{bmatrix} 1 & -3 \\ 4 & 7 \\ 1 & -1 \end{bmatrix}^T + 2\begin{bmatrix} 2 & -2 & 1 & 1 \\ -3 & 3 & -4 & 2 \end{bmatrix} =$

6) $\left(\begin{bmatrix} -1 & 2 \\ 4 & 0 \end{bmatrix}^T + \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix} \right)^T - \begin{bmatrix} 8 & 2 \\ 2 & 4 \end{bmatrix}^T =$

7) $\begin{bmatrix} 3 & 3 & 1 \\ 2 & -2 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ -1 & 2 \end{bmatrix} =$

8) $\begin{bmatrix} 1 & 2 \\ 3 & -4 \\ -1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & 3 & 1 \\ 2 & -2 & 0 \end{bmatrix} =$

9) $\begin{bmatrix} -2 & 3 \\ 1 & 5 \end{bmatrix}^2 =$

10) $\begin{bmatrix} 2 & 3 & 0 \\ -2 & 4 & 5 \\ 3 & 3 & 8 \end{bmatrix} \begin{bmatrix} 4 & 4 & 2 \\ -2 & 1 & 5 \end{bmatrix} =$

11) $\begin{bmatrix} -4 & 2 & 3 \\ -2 & -1 & 1 \end{bmatrix}\begin{bmatrix} 0 & 0 & 1 \\ 2 & 1 & 0 \end{bmatrix}^T \begin{bmatrix} 3 & 2 \\ 1 & -2 \end{bmatrix} =$

12) $\left(\begin{bmatrix} 1 & -3 & -1 \\ 1 & 2 & 6 \end{bmatrix}\begin{bmatrix} 1 & 0 & -1 \\ 0 & 4 & 5 \\ -3 & -2 & 2 \end{bmatrix} + \begin{bmatrix} -4 & -2 \\ 1 & 3 \\ -2 & 0 \end{bmatrix}^T \right)^T =$

13) $3\begin{bmatrix} 3 & -1 & 1 \\ -1 & 0 & 4 \end{bmatrix}^T \begin{bmatrix} 0 & 2 \\ 1 & 4 \end{bmatrix}\begin{bmatrix} 4 & 3 & 2 \\ -3 & 1 & 2 \\ 0 & 1 & 5 \end{bmatrix}\begin{bmatrix} 5 & 5 \\ 0 & 5 \end{bmatrix} =$

14) $\begin{bmatrix} 3 & -1 & 1 \\ 1 & 1 & 5 \end{bmatrix}^T \begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix} + 2\begin{bmatrix} -2 & 1 \\ 4 & 5 \\ 8 & 1 \end{bmatrix} =$

END