



GATE SMASHERS

GATE2024

Engineering Mathematics

Topic: Probability and Statistics

Subtopic: *Operation of Matrices*

LECTURE - 2

EXPLANATION

Addition of Matrices:-

If,  $A = [a_{ij}]_{m \times n}$  &  $B = [b_{ij}]_{m \times n}$   
then  $A + B = [a_{ij} + b_{ij}]_{m \times n}$ .



Properties of Matrix Addition:-

1.  $A + B = B + A$ .
2.  $(A + B) + C = A + (B + C)$
3.  $A + O = A = O + A$
4.  $(-A) + A = O = A + (-A)$
5.  $A + X = B + X \Rightarrow A = B$
6. The equation  $A + X = O$  has unique solution in the set of all  $m \times n$  matrices.

Subtraction of Two Matrices:-

$$A - B = A + (-B).$$

Multiplication of a Matrix by a Scalar:-

If  $A = [a_{ij}]_{m \times n}$  then  $Ak = kA = [kA]_{m \times n}$ .

Properties of Multiplication of a Matrix by a Scalar:-

1.  $k(A + B) = kA + kB$ .
2.  $(p + q)A = pA + qA$ .
3.  $p(qA) = (pq)A$ .
4.  $(-k)A = -(kA) = k(-A)$

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LECTURE - 46

EXPLANATION

Multiplication of Two Matrices :-

If  $A = [a_{ij}]_{m \times n}$   $B = [b_{ij}]_{n \times p}$  then  $AB = C [c_{ij}]_{m \times p}$



Properties of Matrix Multiplication :-

1. Multiplication of matrices is not commutative.
2.  $A(BC) = (AB)C$
3.  $A(B+C) = AB + AC$
4. If  $AB = O$  then it is not necessarily imply that  $BA = O$ . In fact,  $BA$  may not even exist.
5.  $AB = AC \Rightarrow B = C$  (If  $A$  is non-singular matrix)
6.  $A^m A^n = A^{m+n}$
7.  $AI_n = I_n A = A$