IIT-JEE / ENGINEERING

MATHS

FORMULA

Matrices

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IMPORTANT DEFINATIONS, FORMULAE AND METHODS

1. **Matrix :** It is an arrangement of numbers in particular rows and columns. Usually, it is denoted by Z capital letter.
2. **Row Matrix :** A matrix having only one row is called a row matrix.
3. **Column Matrix :** A matrix having only one column is called a column matrix.
4. **Square Matrix :** A matrix having same number of rows and columns is called a square matrix.
5. **Rectangular Matrix :** A matrix, in which number of rows is not equal to number of columns, is called rectangular matrix.
6. **Zero Matrix or Null Matrix :** A matrix having its all elements as zero is called zero matrix.
7. **Identity Matrix or Unit Matrix :** A square matrix in which all the non diagonal elements are zero and all diagonal elements are one is called identity matrix.
8. **Diagonal Matrix :** A square matrix in which every non diagonal element is zero, is called a diagonal matrix.
9. **Scalar Matrix :** A diagonal matrix whose all diagonal elements are same is called a scalar matrix.
10. **Comparable Matrix :** Two matrices A and B are said to be comparable if they are of the same order.
11. **Equal Matrix :** Two matrices are said to be equal if their order is same and the corresponding elements are equal.
12. **Addition of Matrices :** Addition of matrices is possible only if the matrices have same order. The sum of two matrices is a matrix obtained by adding the corresponding elements of the given matrices.
13. **Scalar Multiplication :** When a matrix is multiplied by a scalar number, its all elements are multiplied with that number.
14. **Multiplication of Matrices :** The product AB of two matrices A and B is possible only if the number of the columns of A is equal to the number of rows of B.
15. **Difference of Matrices :** Difference of matrices A and B is the sum of the matrices A and –B.
16. **Transpose of Matrix :** A matrix obtained by interchanging rows and columns of matrix A is called transpose of matrix. It is denoted as A' or A^t.

17. Symmetric Matrix : A square matrix $A=[a_{ij}]$ is said to be a symmetric matrix if and only if $A'=A$ i.e., $a_{ij}=a_{ji}\forall\ i, j.$

18. Skew symmetric Matrix : A square matrix $A=[a_{ij}]$ is said to be a skew symmetric matrix if and only if $A'=-A$ i.e. $a_{ij}=a_{ji}\ \forall$ i, j.

19. Inverse of a Matrix : A square matrix 'B' is said to be an inverse of matrix A if AB = BA = I. It is denoted by A^{-1}.

20. Method to find Inverse of Matrix using elementary row transformations : Let A be a square matrix.

Step I **:** Write A = IA

Step II **:** Apply a sequence operations on L.H.S. and prefactors of product IA till we get I=BA.

Step III **:** The matrix B is the required inverse of matrix A.

Note 1. To find inverse of matrix A, using column operation, write $A=AI$.

2. If after applying one or more elementary row (column) operations, we get all zeros in one row (column), then A^{-1} does not exist.

21. Properties of matrices : Let A, B and C be the matrices of same order.

(i) $A+B=B+A$

(ii) $(A+B)+C=A+(B+C)$

(iii) $A+0=0+A=A$ (0 is an additive identity for matrix addition)

(iv) $A+(-A)=0=(-A)+A$ (0 is an additive inverse of matrix)

(v) $K(A+B)=KA+KB$, K is a scalar.

(vi) $(K+l)A=KA+lA$, K and l are scalars.

(vii) $(AB)\,C=A\,(BC)$

(viii) $A(B+C)=AB+AC$

(ix) $(A+B)C=AC+BC$

(x) $AI=IA=A$

(xi) $(A')'=A$

(xii) $(A+B)'=A'+B'$

(xiii) $(KB)'=KB'$, where K is any constant

(xiv) $(AB)'=B'A'$

(xv) $(AB)^{-1} = B^{-1}A^{-1}$

(xvi) $AA^{-1} = A^{-1}A = I$

(xvii) $(A^{-1})' = (A')^{-1}$

(xviii) $(A^{-1})^{-1} = A$

(xix) $(A^n)^{-1} = (A^{-1})^n$

22. Some Important Results :

1. Every Identity matrix is a scalar matrix.
2. If AB is defined, then BA need not be defined.
3. If both A and B are square matrices of same order, then both AB and BA are defined.
4. If AB and BA are both defined, it is not necessary that AB = BA.
5. If the product of two matrices is a zero matrix, it is not necessary that one of the matrices is a zero matrix.
6. All the diagonal elements of a skew symmetric matrix are zero.
7. For any square matrix A, $A + A'$ is symmetric matrix and $A - A'$ is a skew symmetric matrix.
8. Any square matrix can be expressed as the sum of a symmetric and a skew symmetric matrix.
9. A rectangular matrix does not possess inverse matrix.
10. Inverse of a matrix, if it exists, is unique.

Note : if any mistake on this, kindly inform on the mail id :

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