Team:- Math Set Σs.

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①

Q:- No. 1

Ans:- Eigenvalues and Eigenvectors:

Consider a square matrix A of order n, and a scalar λ. If we can find a vector x of order n such that

$$AX - \lambda X \longrightarrow (1)$$

Then λ is called an eigenvalue and x is the corresponding eigenvector of matrix A, Now equation (1) maybe written as

$$(A-\lambda)x=0. \quad (2)$$

Equation (2) represents a homogeneous system of linear equation. It possess a non trivial solution if

$$\det(A-\lambda I)=|A-\lambda I|=0. \quad (3).$$

⇒ Characteristic polynomial.

The determinant $(A-\lambda I)$ when explained will be a polynomial. This polynomial is called "Characteristic polynomial" of matrix A.

⇒ Characteristic Equation of matrix

when Characteristic polynomial is ~~equipped~~ equated to zero we get what is called characteristic. Thus if $|A-\lambda I|$ is a Characteristic polynomial then $|A-\lambda I|=0$ is called Characteristic equation of matrix A.

Q:-2

Ans:- Proof:-

$(\lambda-1)^4(\lambda-2)^3(\lambda-3)^2(\lambda-4)$. that is the Characteristic polynomial.

Eigenvalue of A = Roots of $P(A)(\lambda)$.

$4 = 4.$

Degree of the Characteristic polynomial $P(\lambda)$ is the size of matrix.

Since the degree of $P(\lambda)$ is $\Rightarrow 4+3+2+1=10$

The size of matrix of A is 10×10.

From the Characteristic polynomial the eigenvalue of A, 4, 3, 2, 1. In Particular 0 is not an eigen value of A. Hence the null space of A is zero dimensional

The rank nullity theoram

$\text{rank}(A) + \text{nullity}(A) = n \Rightarrow$ means size of matrix

$10 + 0 = 10$

4

$10 = 10$

So hence the rank is 10. Proved.

Q:3

Ans:- Elementary Row operations (ERO)

Many applications in matrix theory make an extensive use of elementary row operations. These elementary row operations are of three types and are presented here.

a) Multiplying a given row by a non-zero number. This is usually denoted by KR_i which means multiply row R_i by a constant K.

b) Interchanging any two rows of matrix. This is usually denoted by R_{ij} which ~~is~~ means interchange row R_i with R_j.

c) Addition of any multiple of one row to another row. This means multiply any row of matrix by a non-zero number and the result so obtained may be added to any other row. This is usually denoted by $KR_i + R_j$. This means multiply row R_i by non-zero number k and result so obtained is R.

Q:4

Ans:- The row operations performed on (A/b) (means augmented matrix) because of taking the solution of given linear system. And for linear system $Ax = b$ does not change solution through row operations b/c a row in a matrix is exactly an equation and when you apply any operation on both sides of equation the equation remains same means the solution that equation does not because unknowns will at same position.