

Swetha D S

**Department of Science and Humanities** 



## **CLASS-8**

## SYMMETRIC MATRICES AND DIAGONALIZATION OF A MATRIX

## **Diagonalization of a matrix**



Statementi et A is à square madrix of order 'n' has 'n' Linearly independent victors, then a matrix 5' can be found such that 5 As is a diagonal matrix. Drost. Let A be a square mostrix of order 3. Let 7,. 2 and 73 be its Eigen value and  $X_1 = \begin{bmatrix} x_1 \\ y_1 \\ 3 \end{bmatrix}$ ,  $X_2 = \begin{bmatrix} x_2 \\ y_2 \\ 3 \end{bmatrix}$  and 13= [13] be the corresponding Eigen Vectors.





$$2 = \begin{bmatrix} 3^{1} & 3^{2} \\ 3^{1} & 3^{7} & 3^{3} \\ 3^{1} & 3^{7} & 3^{3} \end{bmatrix}$$

$$2 = \begin{bmatrix} 3^{1} & 3^{7} & 3^{3} \\ 3^{1} & 3^{7} & 3^{2} \\ 3^{1} & 3^{7} & 3^{7} \end{bmatrix}$$

Multiplying by A, 
$$AS = A[X_1, X_2, X_3] = [AX_1, AX_2, AX_3]$$

$$AS = [X_1, X_2, X_3]$$

$$AS = [X_1, X_2, X_3]$$

$$AS = \begin{bmatrix} x_1 x_1 & x_2 x_3 & x_3 x_3 \\ x_1 x_1 & x_2 x_3 & x_3 x_3 \end{bmatrix} = \begin{bmatrix} x_1 & x_2 & x_3 \\ y_1 & y_1 & y_2 \\ x_1 & x_2 & x_3 x_3 \end{bmatrix} = \begin{bmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \end{bmatrix} = \begin{bmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_2 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\ y_3 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_1 & y_3 & y_3 \\ y_2 & y_3 & y_3 \\$$



Multiplying both sides by 5

5 is invertible because its columns (the light rectors)

mue annumed to be independent.

## NOTE:

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- 1. Any matrix with distinct Eigen Values Can be diagonise.
- 2. Not all matrices has 'n' Lineary independent Eight victors. Therefore, all the matrices Can't be diagonalized.

Egi: A= [0 1], hele ]= 12=0. There is only one independent vector, there we cannot construct S.

- 3. It Eigen victors X, 1x2, --- Xk correspond to distinct Eigen values 7, 12, --- Xk correspond to Eigen victors are linearly independent.
- 4. Eiger veckor matrix in not unique since it it is an Eigen vector conceponating to > then kx in also an Eigen vector.



Problem

1. Factor the moders 
$$A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$
 into  $S \wedge S^{-1} \wedge A$ 

also find  $S \wedge S^{-1}$ .

Action the moders  $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$  into  $S \wedge S^{-1} \wedge A$ 

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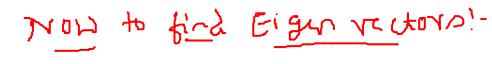
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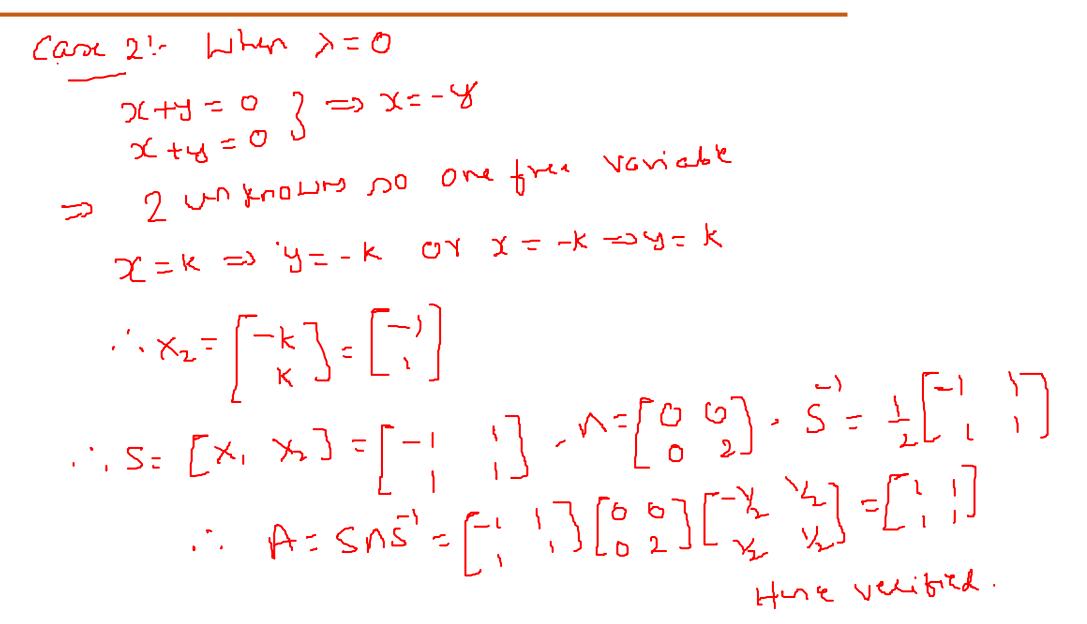
$$A =$$



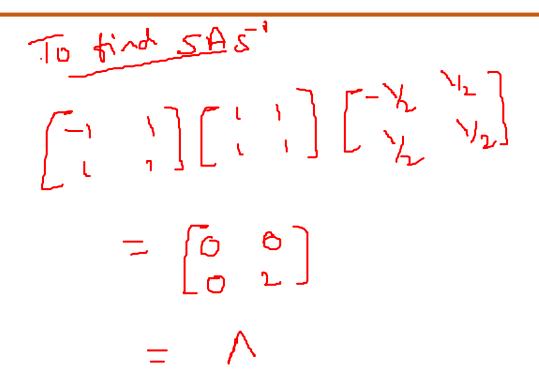


=> 1 equations much 2 unknowns ... y bet free Variable ... 7= y=k, but k=1













## THANK YOU

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