

SIS

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COIMBATORE-641 035, TAMIL NADU

	Properties of eigen values and eigen vectors.
	The service was so all regardly the services
1.	The sum of the eigen values of a matrix
	The sum of the eigen values of a matrix is the sum of the principal diagonal elements
	i.e., Trace of A.
2.	The product of the eigen values of
1 74 50 64	matrix H 15 Equal to
3.	If $\lambda_1, \lambda_2, \lambda_3, \cdots, \lambda_n$ are the
	of a matrix A then 1 1 1 are
	the eigen values of A-1
4	If $\lambda_1, \lambda_2, \lambda_3, \dots \lambda_n$ are the eigen values
* * (1	of A then $k\lambda_1$, $k\lambda_2$, $k\lambda_n$ are the
1001	eigen values of to whom K is a scalar.
4	eigen values of KA, where K is a scalar.
9	If $\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_n$ are the eigen values
	of the matrix A then λ_1^m , λ_2^m , λ_n^m
	are the eigen values of the matrix Am (m being +ve integer)
4.	If $\lambda_1, \lambda_2, \lambda_3, \dots \lambda_n$ are the eigen of
1	
	the matrix A then A,- K; 12-King In- K
	Eigen Values of the matrix (A-KI)
	Eigen Values of the matrices A and AT are the same.
8.	The eigen values of a real symmetrics :
	matrix are all real.
9.	The eigen values of a unitary matrices
	are of junit modulus
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DEPARTMENT OF MATHEMATICS

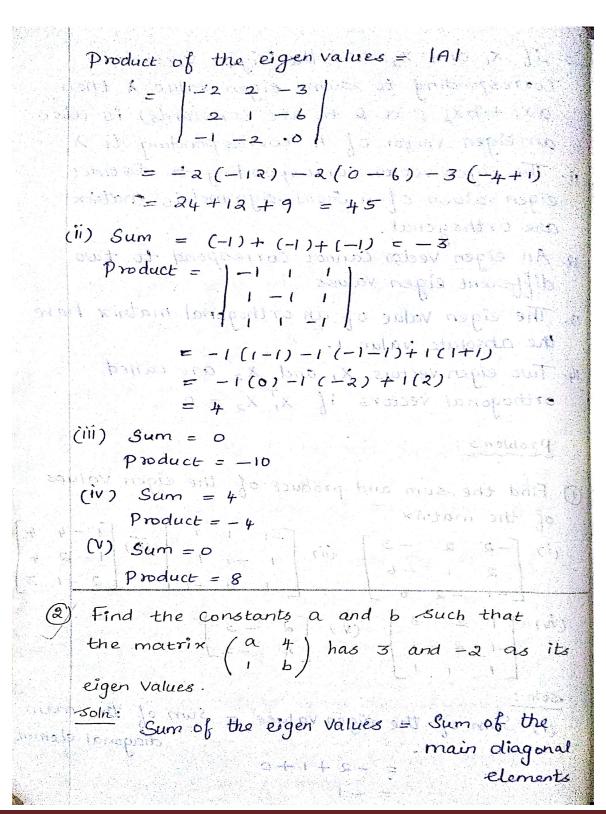
10. If x, and x, are the eigen vectors Corresponding to same eigen value & then ax, + bx, (a & b are constants) is also an eigen vector of A corresponding to A. 11. The eigen vector corresponding to distinct eigen values of a real symmetric matrix are orthogonal. 12. An eigen Vector Cannot Correspond to two different eigen values. 13. The eigen value of an orthogonal matrix have the absolute value 1. 14. Two eigen vectors X, and X2 are called orthogonal vectors if X, X2 = 0 Problems: Find the sum and product of the eigen values of the matrix

(i) $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \end{bmatrix}$ (ii) $\begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$ (iii) $\begin{bmatrix} 1 & -4 & 4 \\ 1 & -2 & 4 \\ 2 & -1 & 3 \end{bmatrix}$ (i) Sum of the eigen values = Sum of the main major diagona = -2 + 1 + 0



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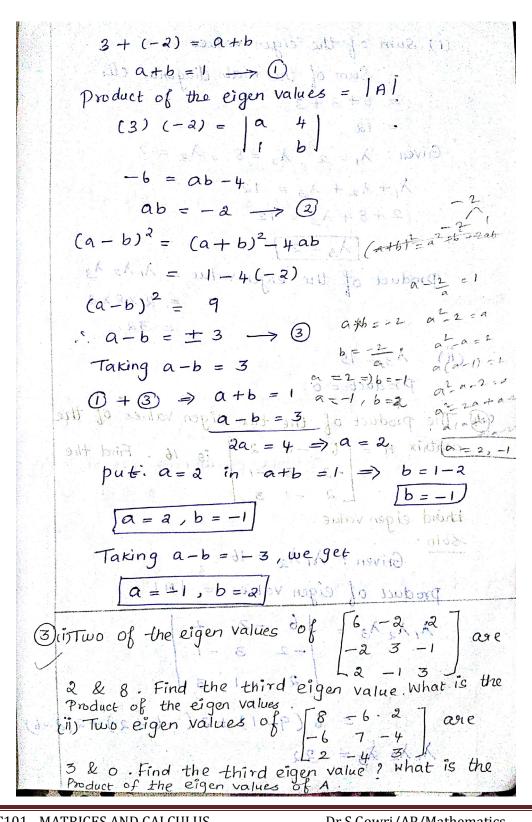




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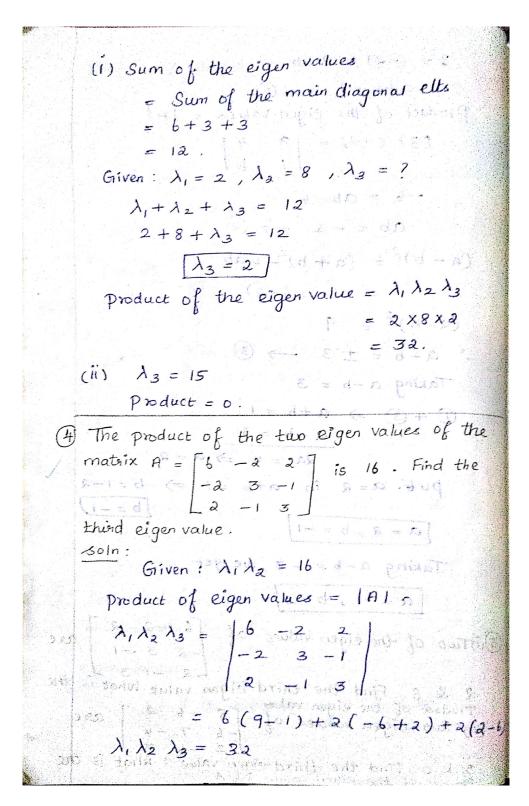
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Case (ii):
$$\lambda = -3$$

$$\begin{pmatrix} 1 & 2 & -3 \\ 2 & 4 & -6 \\ -1 & -2 & 3 \end{pmatrix} \begin{pmatrix} \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$
All the three evactions are same.
$$\chi_1 + 2\chi_2 - 3\chi_3 = 0$$
Put $\chi_1 = 0$,
$$2\chi_2 = 3\chi_3$$

$$\frac{\chi_2}{3} = \frac{\chi_3}{3}$$

$$\frac{\chi_3}{3} = \frac{\chi_3}{3}$$
Put $\chi_2 = 0$,
$$\chi_1 = 3\chi_3$$

$$\frac{\chi_1}{3} = \frac{\chi_3}{3}$$

$$\frac{\chi_1}{3} = \frac{\chi_3}{3}$$
Figor values: $5 - 3 - 3$
Eigon vectors: $\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \begin{pmatrix} 0 \\ 3 \\ 2 \end{pmatrix} \begin{pmatrix} 5 \\ 0 \\ 1 \end{pmatrix}$

$$\begin{pmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix} \xrightarrow{\text{Soln}} : \chi : \begin{pmatrix} 4 \\ 1 \\ -7 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$$

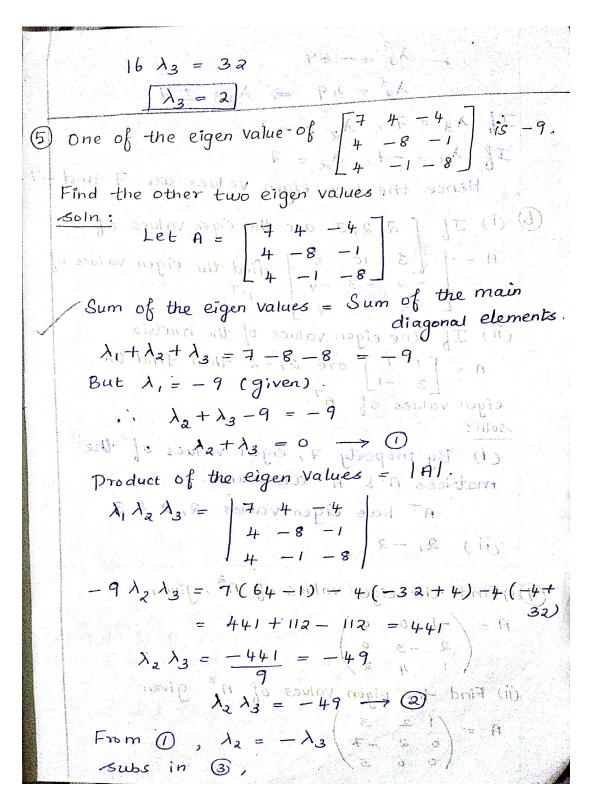
$$\begin{pmatrix} 3 \\ 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix} \xrightarrow{\text{Soln}} : \chi : \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$$





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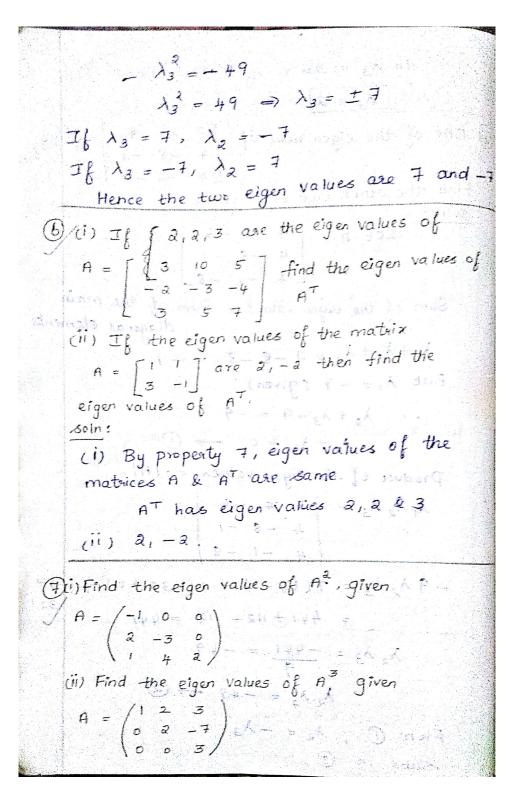
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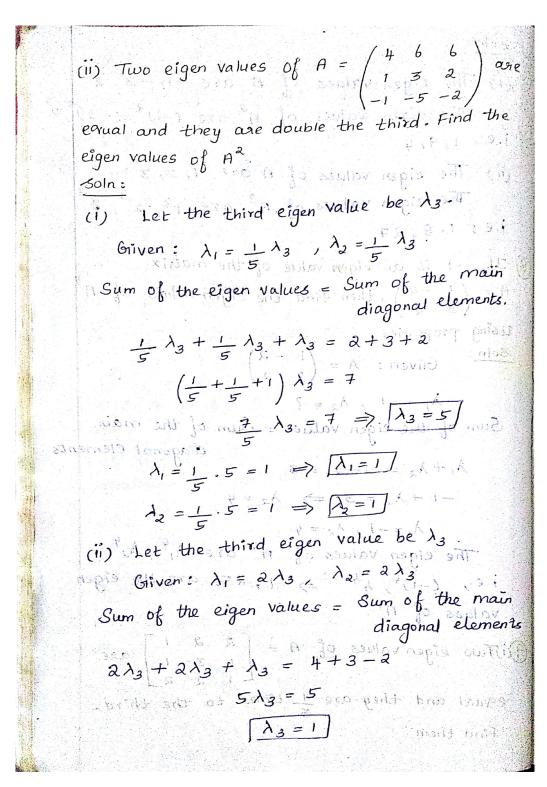
soln: (i) The eigen values of A are $-1, -3, 2$ The eigen values of A^2 are $(-1)^3, (-3)^3, 2^2$ i.e., 1,9,4 (ii) The eigen values of A are $1, 2, 3$
The eigen values of A3 are 13, 2, 3
8 If -1 is an eigen value of the matrix $A = \begin{pmatrix} 1 & -a \\ 3 & a \end{pmatrix}, \text{ then find the eigen values of } A^{\frac{1}{4}}$
using properties. Soln: Given: $A = \begin{pmatrix} 1 & -2 \\ 3 & 2 \end{pmatrix}$
$\frac{50 \ln z}{Given}$: $A = \begin{pmatrix} 3 & 2 \end{pmatrix}$
$\lambda_1 = -1$, $\lambda_2 = ?$ Sum of the eigen values = Sum of the main diagonal elements
$\lambda_1 + \lambda_2 = 1 + 2 = 3$
$-1+\lambda_2=3\lambda\Rightarrow\lambda_2=4$
The eigen values of Atharent, 4, 12 (1)
i.e., (-1) + 4 => 1/2, 256 are the eigen values of A was = 23 mov rapis set to mus
PijTwo eigen values of $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ are
equal and they are 1 times to the third.
Find them:
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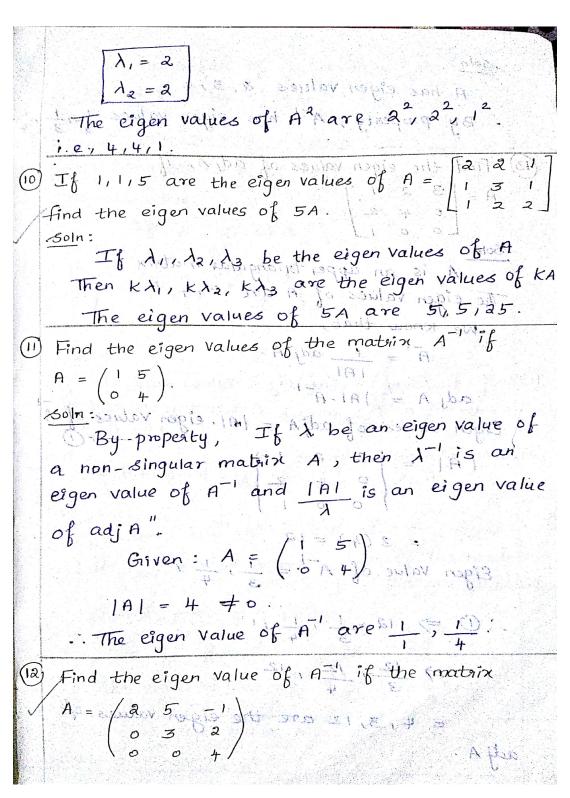
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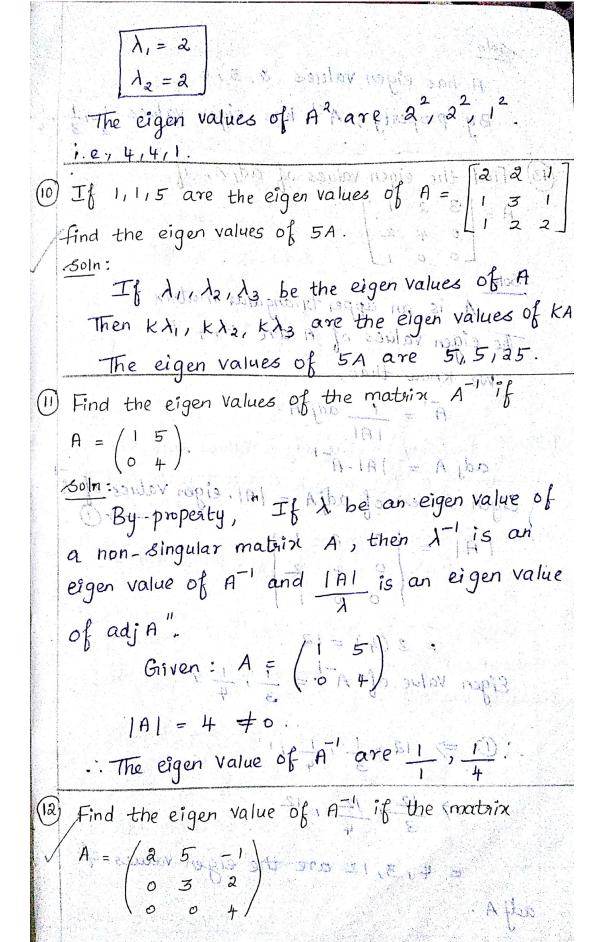
A has eigen values 2,3,4 By property, A has eigen values 1 (13) Find the eigen values of adj A, if $A = \begin{bmatrix} 3 & 2 & 1 \\ 0 & 4 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ A = [3] 2 | 1 | 3 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 Soln: A is an upper triangular materix The eigen values of A are 3,4,1 is now in that, to solve mapped and $A = \frac{1}{1AI}$ adj A solve maps and both $A = \frac{1}{1AI}$ adj A = IAI.A - l Eigen values of adj A = IAI. eigen values of A a non-singular matrix & 1818 = 181 an a para value of 111 of on eigen value of 111 of of on eigen value = 3 (4) = 12. Eigen Value of $A^{-1} = \frac{1}{3}, \frac{1}{4}, \frac{1}{4}$ kinds = 12 / 12 / 12 mlav napia adj brij = 4,3,12 are the eigen values of ady A.





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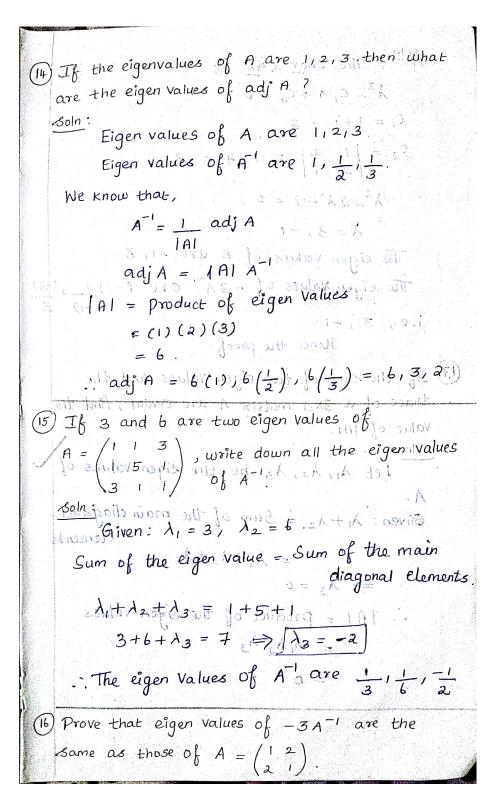
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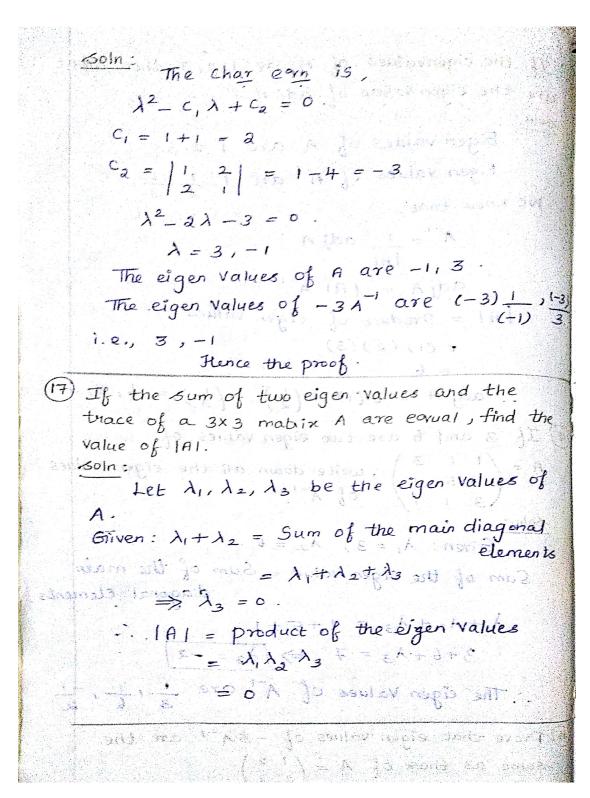
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(B) If the eigenvalue of
$$A = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$$
 are

-1,-1,2 and if two of the eigen vectors of A are

(1), $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$, then find the third eigen vector.

Solar:

Given A is a symmetric matrix.

Let $X_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$, $X_2 = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}$.

 X_3 is orthogonal to X_1 , X_2 , X_3 .

Let $X_3 = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$.

 X_3 is orthogonal to $X_1 \Rightarrow X_3 = 0$.

(a, b, c), $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = 0$.

 $A + b + c = 0 \rightarrow 0$.

 X_3 is orthogonal to $X_2 \Rightarrow X_3 = 0$.

(a, b, c), $\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} = 0$.

Solving $\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} = 0$.

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