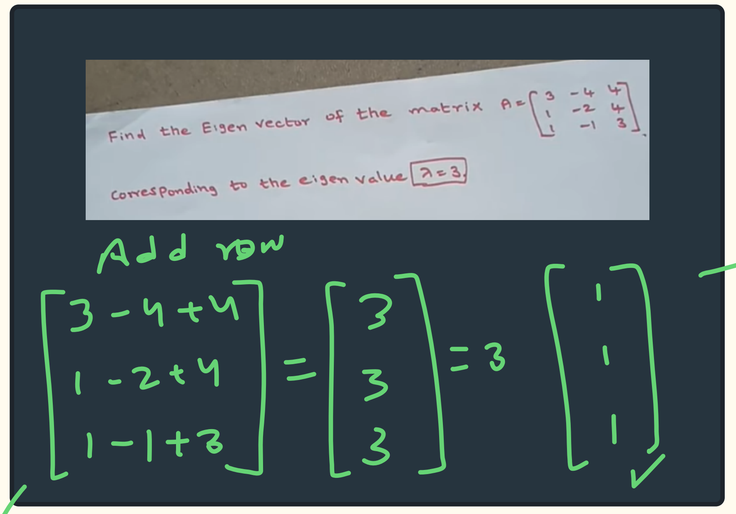
linear algebra

Rank of matrix

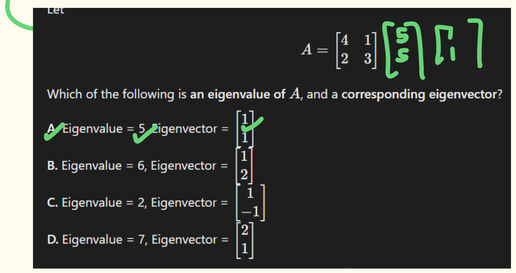
if simple elements haru cha vani find garna lai turn matrix to echelon form ani tespachi aaucha

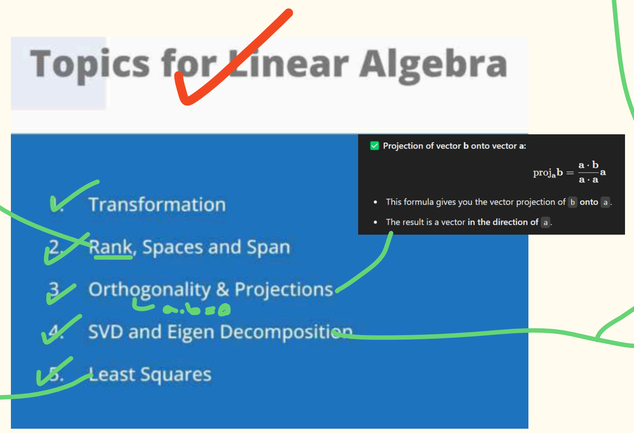
if number haru complex cha calculate garna time lagcha vani

use calc to find determinant of 3
if d.3 = 0 , d.3 not equal = vaye rank is 3
find d.2, if d.2 =0 find every d.2 inside matrix,rank 2



jaile trace sanga milcha vanne hunna kaile kai add row

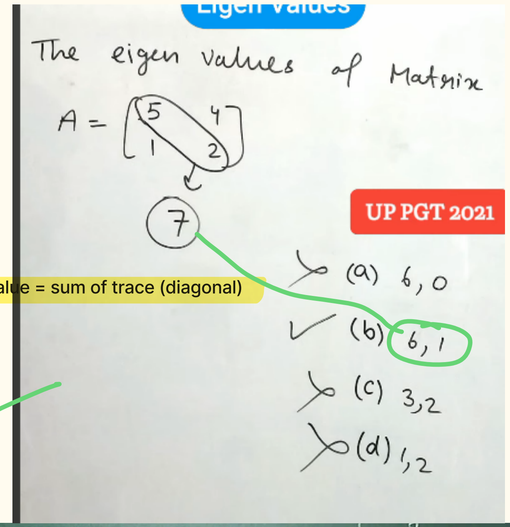




Projection of vector b onto vector a:

$$\text{proj}_{\mathbf{a}}\mathbf{b} = \frac{\mathbf{a}\cdot\mathbf{b}}{\mathbf{a}\cdot\mathbf{a}}\mathbf{a}$$

- This formula gives you the vector projection of b onto a.
- The result is a vector in the direction of a.



sum of eigen value = sum of trace (diagonal)

Suppose we have:

$$A = \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$$

We want to solve:

$$Ax = b$$

But this system is overdetermined (3 equations, 2 unknowns).
So we solve:

$$A^T Ax = A^T b$$

Which gives us the **least squares solution**.

$$A^T A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 14 & 6 \\ 6 & 3 \end{bmatrix}$$

$$A^T b = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix} = \begin{bmatrix} 13 \\ 5 \end{bmatrix}$$

Step 2c: Solve the normal equation:

$$\begin{bmatrix} 14 & 6 \\ 6 & 3 \end{bmatrix} \cdot \begin{bmatrix} m \\ b \end{bmatrix} = \begin{bmatrix} 13 \\ 5 \end{bmatrix}$$

$$\boxed{y = 1.5x - 1.33}$$