

1. Let $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 4 & 1 \\ 2 & -4 & 0 \end{bmatrix}$. The matrix A has an eigenvalue 2. Find a basis of the eigenspace E_2 corresponding to the eigenvalue 2.

2. Let A be a 3×3 matrix. Suppose that A has eigenvalues 2 and -1 , and suppose that \mathbf{u} and \mathbf{v} are eigenvectors corresponding to 2 and -1 , respectively, where

$$\mathbf{u} = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} \text{ and } \mathbf{v} = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$$

Then compute $A^5 \mathbf{w}$, where $\mathbf{w} = \begin{bmatrix} 7 \\ 2 \\ -3 \end{bmatrix}$

3. Find all the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 3 & -2 \\ 6 & -4 \end{bmatrix}$.

4. Find all eigenvalues and corresponding eigenvectors for the matrix A if $A = \begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$