

1. Verify that $\lambda_1 = -1$, $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $\lambda_2 = 2$, $\mathbf{v}_2 = \begin{bmatrix} 5 \\ 2 \end{bmatrix}$ are eigenvalue and corresponding eigenvector pairs for

$$\mathbf{A} = \begin{bmatrix} 4 & -5 \\ 2 & -3 \end{bmatrix}$$

2. Find the eigenvalues and corresponding eigenvectors for $\mathbf{A} = \begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$.

$$(\text{answer: } \lambda_1 = 0, \mathbf{v}_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \text{ and } \lambda_2 = 7, \mathbf{v}_2 = \begin{bmatrix} 3 \\ -1 \end{bmatrix})$$

3. Find the eigenvalues and corresponding eigenvectors for $\mathbf{A} = \begin{bmatrix} 1 & -3/2 \\ 1/2 & -1 \end{bmatrix}$.

$$(\text{answer: } \lambda_1 = -1/2, \mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \text{ and } \lambda_2 = 1/2, \mathbf{v}_2 = \begin{bmatrix} 3 \\ 1 \end{bmatrix})$$

4. Find the eigenvalues and corresponding eigenvectors for $\mathbf{A} = \begin{bmatrix} 2 & -2 & 3 \\ 0 & 3 & -2 \\ 0 & -1 & 2 \end{bmatrix}$.

$$(\text{answer: } \lambda_1 = 4, \mathbf{v}_1 = \begin{bmatrix} 7 \\ -4 \\ 2 \end{bmatrix}, \lambda_2 = 2, \mathbf{v}_2 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \text{ and } \lambda_3 = 1, \mathbf{v}_3 = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix})$$

5. Find the eigenvalues and corresponding eigenvectors for $\mathbf{A} = \begin{bmatrix} 0 & -3 & 5 \\ -4 & 4 & -10 \\ 0 & 0 & 4 \end{bmatrix}$.

$$(\text{answer: } \lambda_1 = -2, \mathbf{v}_1 = \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}, \lambda_2 = 4, \mathbf{v}_2 = \begin{bmatrix} 5 \\ -10 \\ -2 \end{bmatrix} \text{ and } \lambda_3 = 6, \mathbf{v}_3 = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix})$$

6. Find the eigenvalues and corresponding eigenvectors for $\mathbf{A} = \begin{bmatrix} 3 & -4 \\ 1 & 3 \end{bmatrix}$.

$$(\text{answer: } \lambda_1 = 3 + 2i, \mathbf{v}_1 = \begin{bmatrix} 2 \\ -i \end{bmatrix} \text{ and } \lambda_2 = 3 - 2i, \mathbf{v}_2 = \begin{bmatrix} 2 \\ i \end{bmatrix})$$

7. Find the eigenvalues and corresponding eigenvectors for $\mathbf{A} = \begin{bmatrix} -1 & 3 & -4 \\ -2 & 3 & -4 \\ 1 & 1 & 3 \end{bmatrix}$.

$$(\text{answer: } \lambda_1 = 1, \mathbf{v}_1 = \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix}, \lambda_2 = 2 + 3i, \mathbf{v}_2 = \begin{bmatrix} -1 + 5i \\ -2 + 4i \\ 3 \end{bmatrix} \text{ and } \lambda_3 = 2 - 3i, \mathbf{v}_3 = \begin{bmatrix} -1 - 5i \\ -2 - 4i \\ 3 \end{bmatrix})$$