



A Level Maths

Topic: Determinants and Eigenvalues

Instructions

Answer all questions. Show complete working. Use the appropriate methods to find the determinant and eigenvalues of matrices.

Practice Questions

1. Calculate the determinant of the following matrices:

(i) $A = \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix}$

(ii) $B = \begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$

(iii) $C = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{pmatrix}$

2. Find the determinant of the matrix $D = \begin{pmatrix} 2 & 1 & 3 \\ 4 & -2 & 1 \\ 5 & 3 & -1 \end{pmatrix}$.

3. Find the eigenvalues of the following matrix:

$$A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$$

4. Given the matrix $A = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$, find the eigenvalues and eigenvectors.

5. Find the eigenvalues of the matrix $A = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$.

6. Solve for the eigenvalues of the matrix $B = \begin{pmatrix} 3 & 1 & 0 \\ 1 & 3 & 1 \\ 0 & 1 & 3 \end{pmatrix}$.
7. Find the eigenvalues of the matrix $C = \begin{pmatrix} 5 & 2 \\ 2 & 5 \end{pmatrix}$.
8. For the matrix $M = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 6 & 7 & 8 \end{pmatrix}$, calculate its determinant and its eigenvalues.
9. Given the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \\ 1 & 2 & 4 \end{pmatrix}$, find the determinant and eigenvalues.
10. Find the determinant of the matrix $P = \begin{pmatrix} 2 & 3 \\ 4 & 6 \end{pmatrix}$ and explain if the matrix is invertible.

Multiple-Choice Questions

1. The determinant of the matrix $A = \begin{pmatrix} 5 & 2 \\ 3 & 1 \end{pmatrix}$ is:
- A. 1
 - B. 2
 - C. -1
 - D. -2
2. The eigenvalues of the matrix $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$ are:
- A. 2, 5
 - B. 3, 4
 - C. 1, 6
 - D. 5, 6
3. The matrix $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ has the eigenvalues:
- A. 0, 1
 - B. 1, 1
 - C. 0, 0
 - D. 1, -1