

Matrices — Assignment 2

Class 12 Maths · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
 (2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
 (3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Notation and Types of Matrices

1. Construct a 2×2 matrix whose elements are $a_{ij} = i + j$.
2. Write an example of a diagonal matrix of order 3.
3. Construct a 3×2 matrix whose elements are $a_{ij} = 2i - j$.

Addition and Scalar Multiplication

1. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find $2A$.
2. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, find $A + B$.
3. Find X if $2X + A = B$, where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ 1 & 2 \end{bmatrix}$.

Multiplication of Matrices

1. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$, find AB .
2. Find the product of a 1×2 row matrix and a 2×1 column matrix.
3. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, find AB and BA and show they differ.

Transpose, Symmetric and Invertibility

1. Show that $A = \begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}$ is symmetric.
2. Find the transpose of $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$.
3. Show that $A = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$ is skew-symmetric.

Part B — Integrated problems (multi-topic)

1. Construct a 2×2 matrix whose elements are $a_{ij} = i + j$.
2. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find $2A$.
3. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$, find AB .
4. Find the transpose of $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$.
5. Show that $A = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$ is skew-symmetric.

Answer Key

Notation and Types of Matrices

$\begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}$, $\text{diag}(1, 2, 3)$. 3×2 matrix with $a_{ij} = 2i - j$.

Addition and Scalar Multiplication

$2A = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$. $A + B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$. $X = \begin{bmatrix} 1 & -1 \\ -1 & -1 \end{bmatrix}$.

Multiplication of Matrices

$AB = \begin{bmatrix} 4 & 4 \\ 10 & 8 \end{bmatrix}$. Row $\times$ column = scalar. $AB = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$, $BA = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$ — differ.

Transpose, Symmetric and Invertibility

Symmetric since $A' = A$. Transpose = $\begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$. Skew-symmetric since $A' = -A$.

Integrated problems

1: $\begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}$. 2: $\begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$. 3: $\begin{bmatrix} 4 & 4 \\ 10 & 8 \end{bmatrix}$. 4: $\begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$. 5: $A' = -A$.