MATRICES

TRANSPOSE OF A MATRIX

EXERCISE

Q.1 Verify that $(AB)' = B'A'$ for $A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$ and $B = [1\ 3\ -6]$.

Q.2 If $A = \begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \\ 2 & -2 \end{bmatrix}$, find the transpose of the product $(AB)^T$

(A) $\begin{bmatrix} 11 & -2 \\ 5 & -6 \end{bmatrix}$ (B) $\begin{bmatrix} 11 & 5 \\ -2 & -6 \end{bmatrix}$

(C) $\begin{bmatrix} 7 & 1 \\ 0 & -8 \end{bmatrix}$ (D) $\begin{bmatrix} 7 & 0 \\ 1 & -8 \end{bmatrix}$

Q.3 If A and B are matrices of order $m \times n$ and $n \times m$ respectively, what is the order of the matrix $B^T (A^T)^T$.

(A) $m \times n$ (B) $m \times m$ (C) $n \times n$ (D) Not defined

Q.4 If A, B, C, are three matrices, what does $A^T + B^T + C^T$ equal to?

(A) zero matrix (B) $A + B + C$

(C) $-(A + B + C)$ (D) $(A + B + C)^T$

Q.5 If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ -1 & 1 \end{bmatrix}$, which statement is correct?

(A) $AB = BA$ (B) $AA^T = A^2$

(C) $AB = B^2$ (D) None of these

Q.6 If $A=\begin{bmatrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{bmatrix}$, what is the value of AA^T.

(A) $\begin{bmatrix}\cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta\end{bmatrix}$ (B) $\begin{bmatrix}\cos^2\theta & \sin^2\theta \\ \sin^2\theta & \cos^2\theta\end{bmatrix}$

(C) $\begin{bmatrix}1 & 0 \\ 0 & 1\end{bmatrix}$ (D) $\begin{bmatrix}0 & 0 \\ 0 & 0\end{bmatrix}$

Q.7 If $A=\begin{bmatrix}a & b \\ b & a\end{bmatrix}$, what is the determinant of $|A+A^T|$.

(A) $4(a^2-b^2)$ (B) $2(a^2-b^2)$

(C) a^2-b^2 (D) $4ab$

Q.8 Identify the false statement for suitable matrices A, B.

(A) $(AB)^T=A^TB^T$ (B) $(A^T)^T=A$

(C) $(A-B)^T=A^T-B^T$ (D) $(A^T)^{-1}=(A^{-1})^T$

Q.9 If $A=\begin{bmatrix}2 & 3 & 4 \\ 3 & 4 & 5\end{bmatrix}$, $B=\begin{bmatrix}3 & 4 \\ 2 & 1 \\ 1 & 3\end{bmatrix}$, what is the transpose of the product $(AB)'$

(A) $\begin{bmatrix}16 & 22 \\ 23 & 31\end{bmatrix}$ (B) $\begin{bmatrix}16 & 23 \\ 22 & 31\end{bmatrix}$

(C) $\begin{bmatrix}22 & 31 \\ 16 & 30\end{bmatrix}$ (D) $\begin{bmatrix}23 & 16 \\ 31 & 20\end{bmatrix}$

Q.10 If $A=\begin{bmatrix}3 & x \\ y & 0\end{bmatrix}$ and $A=A^T$, then -

(A) $x=0, y=3$ (B) $x+y=3$

(C) $x=y$ (D) $x=-y$

Q.11 If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, what is the result of AA'

(A) I (B) A (C) A′ (D) 0

Q.12 If A is a matrix of order 3×4, then both AB^T and B^TA are defined if order of B is -

(A) 3×3 (B) 4×4 (C) 4×3 (D) 3×4

ANSWER KEY

2. (C)

3. (D)

4. (D)

5. (D)

6. (C)

7. (A)

8. (A)

9. (A)

10. (C)

11. (A)

12. (D)