Objective Questions

Question 1.
If A and B are 2-rowed square matrices such that

(A+B)=$\begin{pmatrix} 4 & -3 \\ 1 & 6 \end{pmatrix}$ and (A-B)=$\begin{pmatrix} -2 & -1 \\ 5 & 2 \end{pmatrix}$ then AB=?

A. $\begin{pmatrix} -7 & 5 \\ 1 & -5 \end{pmatrix}$

B. $\begin{pmatrix} 7 & -5 \\ 1 & 5 \end{pmatrix}$

C. $\begin{pmatrix} 7 & -1 \\ 5 & -5 \end{pmatrix}$

D. $\begin{pmatrix} 7 & -1 \\ -5 & 5 \end{pmatrix}$

Answer:
(A+B) = $\begin{pmatrix} 4 & -3 \\ 1 & 6 \end{pmatrix}$ $------1$

(A-B) = $\begin{pmatrix} -2 & -1 \\ 5 & 2 \end{pmatrix}$ $------2$

1+2 $\Rightarrow$ 2A = $\begin{pmatrix} 4 & -3 \\ 1 & 6 \end{pmatrix} + \begin{pmatrix} -2 & -1 \\ 5 & 2 \end{pmatrix}$

$\Rightarrow$ 2A = $\begin{pmatrix} 2 & -4 \\ 6 & 8 \end{pmatrix}$

Dividing the matrix by 2

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

1-2 $\Rightarrow$ 2B = $\begin{pmatrix} 4 & -3 \\ 1 & 6 \end{pmatrix} - \begin{pmatrix} -2 & -1 \\ 5 & 2 \end{pmatrix}$

$\Rightarrow 2B = \begin{pmatrix} 6 & -2 \\ -4 & 4 \end{pmatrix}$

Dividing the matrix by 2

$\Rightarrow B = \begin{pmatrix} 3 & -1 \\ -2 & 2 \end{pmatrix}$

A x B=$\begin{pmatrix} 1 & -2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} 3 & -1 \\ -2 & 2 \end{pmatrix}$

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

=$\begin{pmatrix} 7 & -5 \\ 1 & 5 \end{pmatrix}$

Question 2.

If $\begin{pmatrix} 3 & -2 \\ 5 & 6 \end{pmatrix}$ + 2A = $\begin{pmatrix} 5 & 6 \\ -7 & 10 \end{pmatrix}$ then A=?

A. $\begin{pmatrix} 1 & 3 \\ -5 & 4 \end{pmatrix}$

B. $\begin{pmatrix} -1 & 5 \\ -3 & 4 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 4 \\ -6 & 2 \end{pmatrix}$

D. none of these

Answer:

C

$\begin{pmatrix} 3 & -2 \\ 5 & 6 \end{pmatrix}$ + 2A = $\begin{pmatrix} 5 & 6 \\ -7 & 10 \end{pmatrix}$

$\Rightarrow 2A = \begin{pmatrix} 5 & 6 \\ -7 & 10 \end{pmatrix} - \begin{pmatrix} 3 & -2 \\ 5 & 6 \end{pmatrix}$

$\Rightarrow$ 2A = $\begin{pmatrix} 2 & 8 \\ -12 & 4 \end{pmatrix}$

Dividing the matrix by 2

$\Rightarrow$ A = $\begin{pmatrix} 1 & 4 \\ -6 & 2 \end{pmatrix}$

Question 3.

If A=$\begin{pmatrix} 2 & 0 \\ -3 & 1 \end{pmatrix}$and B=$\begin{pmatrix} 4 & -3 \\ -6 & 2 \end{pmatrix}$are such that 4A + 3X = 5B then X=?

A. $\begin{pmatrix} 4 & -5 \\ -6 & 2 \end{pmatrix}$

B. $\begin{pmatrix} 4 & 5 \\ -6 & -2 \end{pmatrix}$

C. $\begin{pmatrix} -4 & 5 \\ 6 & -2 \end{pmatrix}$

D. none of these

Answer:

4A + 3X = 5B

$\Rightarrow$ 4 $\begin{pmatrix} 2 & 0 \\ -3 & 1 \end{pmatrix}$+ 3X = 5$\begin{pmatrix} 4 & -3 \\ -6 & 2 \end{pmatrix}$

$\Rightarrow$ 3X = 5$\begin{pmatrix} 4 & -3 \\ -6 & 2 \end{pmatrix}$-4 $\begin{pmatrix} 2 & 0 \\ -3 & 1 \end{pmatrix}$

$\Rightarrow$ 3X = $\begin{pmatrix} 20 & -15 \\ -30 & 10 \end{pmatrix}$- $\begin{pmatrix} 8 & 0 \\ -12 & 4 \end{pmatrix}$

$\Rightarrow$ 3X = $\begin{pmatrix} 12 & -15 \\ -18 & 6 \end{pmatrix}$

Dividing by 3

$\Rightarrow$ X = $\begin{pmatrix} 4 & -5 \\ -6 & 2 \end{pmatrix}$

Question 4.

If (A-2B)= $\begin{pmatrix} 1 & -2 \\ 3 & 0 \end{pmatrix}$ and (2A-3B) = $\begin{pmatrix} -2 & 2 \\ 3 & -3 \end{pmatrix}$ then B=?

A. $\begin{pmatrix} 6 & -4 \\ -3 & 3 \end{pmatrix}$

B. $\begin{pmatrix} -4 & 6 \\ -3 & -3 \end{pmatrix}$

C. $\begin{pmatrix} 4 & -6 \\ 3 & -3 \end{pmatrix}$

D. none of these

Answer:
B

(A-2B) = $\begin{pmatrix} 1 & -2 \\ 3 & 0 \end{pmatrix}$

Multiplying equation by 2

2A-4B = $\begin{pmatrix} 2 & -4 \\ 6 & 0 \end{pmatrix}$ ------------- (i)

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

(ii)-(i)

B = $\begin{pmatrix} -2 & 2 \\ 3 & -3 \end{pmatrix}$ - $\begin{pmatrix} 2 & -4 \\ 6 & 0 \end{pmatrix}$

= $\begin{pmatrix} -4 & 6 \\ 3 & -3 \end{pmatrix}$

Question 5.

If $(2A - B) = \begin{pmatrix} 6 & -6 & 0 \\ -4 & 2 & 1 \end{pmatrix}$ and $(2B + A) = \begin{pmatrix} 3 & 2 & 5 \\ -2 & 1 & -7 \end{pmatrix}$ then A=?

A. $\begin{pmatrix} -3 & 2 & 1 \\ 2 & 1 & -1 \end{pmatrix}$

B. $\begin{pmatrix} 3 & 2 & -1 \\ 2 & -1 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 3 & -2 & 1 \\ -2 & 1 & -1 \end{pmatrix}$

D. none of these

Answer:

$(2A - B) = \begin{pmatrix} 6 & -6 & 0 \\ -4 & 2 & 1 \end{pmatrix}$

Multiplying by 2

$4A - 2B = \begin{pmatrix} 12 & -12 & 0 \\ -8 & 4 & 2 \end{pmatrix}$ -------- (i)

$2B + A = \begin{pmatrix} 3 & 2 & 5 \\ -2 & 1 & -7 \end{pmatrix}$ --------- (ii)

(i)+ (ii)

$5A = \begin{pmatrix} 12 & -12 & 0 \\ -8 & 4 & 2 \end{pmatrix} + \begin{pmatrix} 3 & 2 & 5 \\ -2 & 1 & -7 \end{pmatrix}$

$= \begin{pmatrix} 15 & 10 & 5 \\ -10 & 5 & -5 \end{pmatrix}$

Dividing each element of the matrix by 5

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

Question 6.

If $2\begin{pmatrix} 3 & 4 \\ 5 & x \end{pmatrix} + \begin{pmatrix} 1 & y \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 7 & 0 \\ 10 & 5 \end{pmatrix}$

A. (x=-2, y=8)

B. (x=2, y=-8)

C. (x=3, y=-6)

D. (x=-3, y=6)

Answer:

$2\begin{pmatrix} 3 & 4 \\ 5 & x \end{pmatrix} + \begin{pmatrix} 1 & y \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 7 & 0 \\ 10 & 5 \end{pmatrix}$

To solve this problem we will use the comparison that is we will use that all the elements of L.H.S are equal to R.H.S .

$= \begin{pmatrix} 6 & 8 \\ 10 & 2x \end{pmatrix} + \begin{pmatrix} 1 & y \\ 0 & 1 \end{pmatrix}$

$= \begin{pmatrix} 7 & 8+y \\ 10 & 2x+1 \end{pmatrix}$

Comparing with R.H.S

8+y = 0

y= -8

2x+1 = 5

2x = 4

x=2

Question 7.

If $\begin{pmatrix} x-y & 2x-y \\ 2x+z & 3z+w \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 5 & 13 \end{pmatrix}$ then

A. z=3, w=4

B. z=4, w=3

C. z=1, w=2

D. z=2, w=-1

Answer:
A

By comparing L.H.S and R.H.S

x - y = -1 -------- i

2x – y = 0 -------- ii

2x+ z = 5 --------- iii

3z + w =13 ------- iv

Using i in equation ii

x = -1 + y

ii becomes, -2 + 2y –y = 0

y = 2

x = 1

Putting x in iii

2 + z =5

z = 3

Putting z in iv

9 + w = 13

w = 4

Question 8.

If $\begin{pmatrix} x & y \\ 3y & x \end{pmatrix}\begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ then

A. x=1, y=2

B. x=2, y=1

C. x=1, y=1

D. none of these

Answer:
C

$\begin{pmatrix} x & y \\ 3y & x \end{pmatrix}\begin{pmatrix} 1 \\ 2 \end{pmatrix}$

$= \begin{pmatrix} x \times 1 + y \times 2 \\ 3y \times 1 + x \times 2 \end{pmatrix}$

$= \begin{pmatrix} x + 2y \\ 3y + 2x \end{pmatrix}$

Comparing with R.H.S

x + 2y = 3 ------- (i)

2x + 3y = 5 -------- (ii)

(i) x 2 – (ii)

2x + 4y – 2x + 3y = 6 - 5

y = 1

Putting y in (i)

x + 2(1) = 3

x= 1

Question 9.

If the matrix A = $\begin{pmatrix} 3-2x & x+1 \\ 2 & 4 \end{pmatrix}$ is singular then x=?

A. 0

B. 1

C. -1

D. -2

Answer:
When a given matrix is singular then the given matrix determinant is 0.

$|A| = 0$

Given, A = $\begin{pmatrix} 3-2x & x+1 \\ 2 & 4 \end{pmatrix}$

$|A| = 0$

4(3-2x) – 2(x+1) = 0

12 – 8x -2x -2 =0

10 -10x= 0

10x = 0

x= 1

Question 10.
If A_α = $\begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$ then $(A_\alpha)^2$=?

A. $\begin{pmatrix} \cos^2\alpha & \sin^2\alpha \\ -\sin^2\alpha & \cos^2\alpha \end{pmatrix}$

B. $\begin{pmatrix} \cos 2\alpha & \sin 2\alpha \\ -\sin 2\alpha & \cos 2\alpha \end{pmatrix}$

C. $\begin{pmatrix} 2\cos\alpha & 2\sin\alpha \\ -\sin\alpha & 2\cos\alpha \end{pmatrix}$

D. none of these

Answer:

Given, $A_\alpha = \begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$

$A_\alpha^2 = \begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}\begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$

$= \begin{pmatrix} \cos\alpha \times \cos\alpha - \sin\alpha \times \sin\alpha & \cos\alpha \times \sin\alpha + \sin\alpha \times \cos\alpha \\ -\sin\alpha \times \cos\alpha - \cos\alpha \times \sin\alpha & -\sin\alpha \times \sin\alpha + \cos\alpha \times \cos\alpha \end{pmatrix}$

$= \begin{pmatrix} \cos^2\alpha - \sin^2\alpha & \cos\alpha\sin\alpha + \sin\alpha\cos\alpha \\ -\sin\alpha\cos\alpha - \cos\alpha\sin\alpha & -\sin^2\alpha + \cos^2\alpha \end{pmatrix}$

$= \begin{pmatrix} \cos2\alpha & \sin2\alpha \\ -\sin2\alpha & \cos2\alpha \end{pmatrix}$

Question 11.

If $A = \begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$ be such that $A + A' = I$, then α =?

A. ∏

B. $\frac{\pi}{3}$

C. ∏

D. $\frac{2\pi}{3}$

Answer:

L.H.S: $A + A' = \begin{pmatrix} \cos a & \sin a \\ -\sin a & \cos a \end{pmatrix} + \begin{pmatrix} \cos a & -\sin a \\ \sin a & \cos a \end{pmatrix}$

$= \begin{pmatrix} \cos a + \cos a & \sin a - \sin a \\ -\sin a + \sin a & \cos a + \cos a \end{pmatrix}$

$= \begin{pmatrix} 2\cos a & 0 \\ 0 & 2\cos a \end{pmatrix}$

This will be equal to $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

When 2cosa = 1

cosa $= \frac{1}{2}$

a $= \frac{\pi}{3}$

Question 12.

If $A = \begin{pmatrix} 1 & k & 3 \\ 3 & k & -2 \\ 2 & 3 & -4 \end{pmatrix}$ is singular then k=?

A. $\frac{16}{3}$

B. $\frac{34}{3}$

C. $\frac{33}{2}$

D. none of these

Answer:
When a given matrix is singular then the given matrix determinant is 0.

$|A| = 0$

Given,

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

$|A| = 0$

$1(-4k + 6) - k(-12 + 4) + 3(9 - 2k) = 0$

$-4k + 6 + 12k - 4k + 27 - 6k = 0$

$-2k + 33 = 0$

$k = \frac{33}{2}$.

Question 13.

If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ then adj A=?

A. $\begin{pmatrix} d & -c \\ -b & a \end{pmatrix}$

B. $\begin{pmatrix} -d & b \\ c & -a \end{pmatrix}$

C. $\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

D. $\begin{pmatrix} -d & -b \\ c & a \end{pmatrix}$

Answer:

To find adj A we will first find the cofactor matrix

$C_{11} = d$ $C_{12} = -c$

$C_{21} = -b$ $C_{22} = a$

Cofactor matrix $A = \begin{pmatrix} d & -c \\ -b & a \end{pmatrix}$

Adj $A = \begin{pmatrix} d & -c \\ -b & a \end{pmatrix}'$

$= \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

Question 14.

If A = $\begin{pmatrix} 2x & 0 \\ x & x \end{pmatrix}$ and A^{-1}= $\begin{pmatrix} 1 & 0 \\ -1 & 2 \end{pmatrix}$ then x=?

A. 1

B. 2

C. $\frac{1}{2}$

D. -2

Answer:

We know that A x A^{-1} = I

$$\begin{pmatrix} 2x & 0 \\ x & x \end{pmatrix}\begin{pmatrix} 1 & 0 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 2x \times 1 + 0 \times (-1) & 2x \times 0 + 0 \times 2 \\ x \times 1 + x \times (-1) & x \times 0 + x \times 2x \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 2x & 0 \\ 0 & 2x \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

To satisfy the above condition 2x = 1

$x = \frac{1}{2}$

Question 15.

If A and B are square matrices of the same order then (A + B)(A – B) = ?

A. $(A^2 - B^2)$

B. $A^2 + AB - BA - B^2$

C. $A^2 - AB + BA - B^2$

D. none of these

Answer:

Since A and B are square matrices of same order.

$(A+B)(A-B) = A^2 - AB + BA - B$

Question 16.
If A and B are square matrices of the same order then $(A + B)^2$ =?
A. $A^2 + 2AB + B^2$

B. $A^2 + AB + BA + B^2$

C. $A^2 + 2BA + B^2$

D. none of these

Answer:
Since A and B are square matrices of same order.

$(A + B)^2 = (A + B)(A + B)$

$= A^2 + AB + BA + B^2$

Question 17.
If A and B are square matrices of the same order then $(A - B)^2$ =?
A. $A^2 - 2AB + B^2$

B. $A^2 - AB - BA + B^2$

C. $A^2 - 2BA + B^2$

D. none of these

Answer:
Since A and B are square matrices of same order.

$(A - B)^2 = (A - B)(A - B)$

$= A^2 - AB - BA + B^2$

Question 18.
If A and B are symmetric matrices of the same order then (AB – BA) is always
A. a symmetric matrix

B. a skew-symmetric matrix

C. a zero matrix

D. an identity matrix

Answer:
Given A and B are symmetric matrices

$A' = A$ --- 1

$B' = B$ ---- 2

Now $(AB - BA)' = (AB)' - (BA)'$

$= B'A' - A'B'$

[$\because (AB)' = B'A'$]

$= BA - AB$ [Using 1 and 2]

$\therefore (AB - BA)' = -(AB - BA)$

AB-BA is a skew symmetric matrix.

Question 19.
Matrices A and B are inverse of each other only when
A. AB=BA

B. AB=BA=0

C. AB=0, BA=I

D. AB=BA=I

Answer:
$A = B^{-1}$

$B = A^{-1}$

We know that

$AA^{-1} = I$

(Given $B = A^{-1}$)

$AB = I$ ------ 1

We know that

$BB^{-1} = I$

(Given $A=B^{-1}$)

$BA = I$ ------ 2

From 1 and 2

$AB = BA = I$

Question 20.
For square matrices A and B of the same order, we have adj(AB)=?
A. (adj A)(adj B)

B. (adj B)(adj A)

C. $|AB|$

D. none of these

Answer:
We know that $(AB)^{-1} = \text{adj}(AB)/ |AB|$

$\text{adj}(AB) = (AB)^{-1}. |AB|$

We also know that $(AB)^{-1} = B^{-1}. A^{-1}$

$|AB| = |A|\,|B|$

Putting them in 1

$\text{Adj}(AB) = B^{-1}. A^{-1}. |\mathbf{A}|. |\mathbf{B}|$

$= (A^{-1}. |\mathbf{A}|)\,(B^{-1}|\mathbf{B}|)$

$= \text{adj}(A)\,\text{adj}(B)$

Since, $\text{adj}(A) = (A)^{-1}. |\mathbf{A}|$

adj (B)= $(B)^{-1}$. $|\mathbf{B}|$

Question 21.
If A is a 3-rowed square matrix and |A|=4 then adj(adj A)=?
A. 4A

B. 16A

C. 64A

D. none of these

Answer:
The property states that

adj(adj A) = $|\mathbf{A}|^{n-2}$. A

Here n=2

adj(adj A) = $|\mathbf{4}|^{3-2}$. A

= 4A

Question 22.
If A is a 3-rowed square matrix and |A|=5 then |adj A|=?
A. 5

B. 25

C. 125

D. none of these

Answer:
The property states that |adj A|= $|A|^{n-1}$

Here n= 3 and |A|=5

|adj A|= $|5|^{3-1}$

= $|5|^2$

= 25.

Question 23.
For any two matrices A and B,
A. AB=BA is always true

B. AB=BA is never true

C. sometimes AB=BA and sometimes AB≠BA

D. whenever AB exists, then BA exists

Answer:
If the two matrices A and B are of same order it is not necessary that in every situation AB= BA

AB= BA = I only when A = B^{-1}

B=A^{-1}

Other time AB≠BA

Question 24.
If A $\begin{pmatrix} 3 & 2 \\ 1 & -1 \end{pmatrix}=\begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$ then A=?

A. $\begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix}$

B. $\begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$

D. none of these

Answer:
The matrix on the R.H.S of the given matrix is of order 2 x 2 and the one given on left side is 2 x 2 . Therefore A has to be a 2 x 2 matrix.

Let A =$\begin{pmatrix} \mathbf{a} & \mathbf{b} \\ \mathbf{c} & \mathbf{d} \end{pmatrix}$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 3 & 2 \\ 1 & -1 \end{pmatrix}=\begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 3a+b & 2a-b \\ 3c+d & 2c-d \end{pmatrix}=\begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$$

3a+b = 4 ----- 1

2a-b = 1 ------ 2

3c+d= 2 ------ 3

2c-d=3 ------- 4

Using 1 and 2

a=1

b=1

Using 3 and 4

c=1

d = -1

So A becomes $\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$

Question 25.
If A is an invertible square matrix then $|A^{-1}|$=?
A. |A|

B. $\frac{1}{|A|}$

C. 1

D.0

Answer:
B

We know that $AA^{-1} = \mathbf{I}$

Taking determinant both sides

$|AA^{-1}| = |I|$

$|A||A^{-1}| = |I|$ ($|AB|=|A||B|$)

$|A||A^{-1}| = 1$ ($|I| = 1$)

$|A^{-1}|= \frac{1}{|A|}$

Question 26.
If A and B are invertible matrices of the same order then $(AB)^{-1}$=?
A. $(A^{-1} \times B^{-1})$

B. $(A \times B^{-1})$

C. $(A^{-1} \times B)$

D. $(B^{-1} \times A^{-1})$

Answer:
$(AB)(AB)^{-1} = I$

$A^{-1}(AB)(AB)^{-1} = IA^{-1}$

$(A^{-1}A)B\ (AB)^{-1}=A^{-1}$

$IB(AB)^{-1} = A^{-1}$

$B(AB)^{-1} = A^{-1}$

$B^{-1}B(AB)^{-1} = B^{-1}\ A^{-1}$

$I\ (AB)^{-1} = B^{-1}A^{-1}$

$(AB)^{-1} = B^{-1}A^{-1}$

Question 27.
If A and B are two nonzero square matrices of the same order such that AB=0 then
A. $|A|=0$ or $|B|=0$

B.|A|=0 and |B|=0

C.|A|≠0 and |B|≠0

D.None of these

Answer:
s AB is a 0 matrix its determinant has to be 0.

So |AB|=|A||B|=0

So |A|=|B|=0

Question 28.
If A is a square matrix such that |A|≠0 and $A^2 - A + 2I = 0$ then A^{-1}=?
A. (I-A)

B. (I+A)

C. $\frac{1}{2}(I-A)$

D. $\frac{1}{2}(I+A)$

Answer:
$^2 - A + 2I = 0$

Multiplying by A^{-1}

$A^{-1}A^2 - A^{-1}A + 2I\,A^{-1} = 0$

$A - I + 2A^{-1} = 0$

$A^{-1} = \frac{1}{2}(I-A)$

Question 29.
If A= $\begin{pmatrix} 1 & \lambda & 2 \\ 1 & 2 & 5 \\ 2 & 1 & 1 \end{pmatrix}$ is not invertible then λ=?
A. 2

B. 1

C. -1

D. 0

Answer:

$$=\begin{pmatrix} 1 & \lambda & 2 \\ 1 & 2 & 5 \\ 2 & 1 & 1 \end{pmatrix}$$

|A|=0

1(2 x 1 – 5 x1) - λ (1 x 1 – 5 x 2) + 2 (1x1 – 2x 2) = 0

-3+9 λ -6 = 0

9 λ = 9

λ = 1

Question 30.

If A=$\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$then A^{-1}=?

A. A

B. –A

C. Adj A

D. –adj A

Answer:

A=$\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$

|A|= $\cos^2\theta$ - ($-\sin^2\theta$)

= $\cos^2\theta$ + ($\sin^2\theta$)

= 1 ---------- (I)

We know that $A^{-1} = \frac{1}{|A|}$ adj A

= adj A [From I]

Question 31.

The matrix A= $\begin{pmatrix} ab & b^2 \\ -a^2 & -ab \end{pmatrix}$ is

A. idempotent

B. Orthogonal

C. Nilpotent

D. None of these

Answer:
Matrix A is said to be nilpotent since there exist a positive integer k=1 such that Ak is zero matrix.

Question 32.

The matrix A= $\begin{pmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{pmatrix}$ is

A. Nonsingular

B. Idempotent

C. Nilpotent

D. Orthogonal

Answer:
Here the diagonal value is 2+3-3= 1

So the given matrix is idempotent.

Question 33.
If A is singular then A(adjA)=?
A. A unit matrix

B.A null matrix

C.A symmetric matrix

D. None of these

Answer:
A(adjA)= A(|A| x A^{-1})

Since determinant of singular matrix is always 0

A(adjA)= 0

So, it is a null matrix.

Question 34.

For any 2-rowed square matrix A, if A(adjA) = $\begin{pmatrix} 8 & 0 \\ 0 & 8 \end{pmatrix}$ then the value of |A| is

A. 0

B.8

C.64

D.4

Answer:

(adjA) = $\begin{pmatrix} 8 & 0 \\ 0 & 8 \end{pmatrix}$

= 8 $\begin{pmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} \end{pmatrix}$

= |A|I

|A|= 8.

Question 35.
If A = $\begin{pmatrix} -2 & 3 \\ 1 & 1 \end{pmatrix}$ then |A^{-1}|=?

A. -5

B. $\frac{-1}{5}$

C. $\frac{1}{25}$

D. 25

Answer:

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

|A|= -2-3 = -5

We know that $|A^{-1}|=\frac{\mathbf{1}}{|\mathbf{A}|}$

= $\frac{\mathbf{1}}{\mathbf{-5}}$

Question 36.

If A = $\begin{pmatrix} 3 & 1 \\ 7 & 5 \end{pmatrix}$ and A^2 + xI = yA then the values of x and y are

A. X=6, y=6

B. X=8, y=8

C. X=5, y=8

D. X=6, y=8

Answer:

^{2} + xI = yA

$\begin{pmatrix} \mathbf{3} & \mathbf{1} \\ \mathbf{7} & \mathbf{5} \end{pmatrix}\begin{pmatrix} \mathbf{3} & \mathbf{1} \\ \mathbf{7} & \mathbf{5} \end{pmatrix}$ + x$\begin{pmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} \end{pmatrix}$ = y$\begin{pmatrix} \mathbf{3} & \mathbf{1} \\ \mathbf{7} & \mathbf{5} \end{pmatrix}$

$\begin{pmatrix} \mathbf{16} & \mathbf{8} \\ \mathbf{56} & \mathbf{32} \end{pmatrix}$+x$\begin{pmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} \end{pmatrix}$ = y$\begin{pmatrix} \mathbf{3} & \mathbf{1} \\ \mathbf{7} & \mathbf{5} \end{pmatrix}$

8$\begin{pmatrix} \mathbf{2} & \mathbf{1} \\ \mathbf{7} & \mathbf{4} \end{pmatrix}$+x$\begin{pmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} \end{pmatrix}$ = y$\begin{pmatrix} \mathbf{3} & \mathbf{1} \\ \mathbf{7} & \mathbf{5} \end{pmatrix}$

Comparing L.H.S and R.H.S

x=8 y=8

Question 37.
If matrices A and B anticommute then
A. AB=BA

B. AB=-BA

C. $(AB)=(BA^{-1})$

D. None of these

Answer:
If A and B anticommute then AB= -BA

Question 38.
If A = $\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$ then adj A=?

A. $\begin{pmatrix} 3 & -5 \\ -1 & 2 \end{pmatrix}$

B. $\begin{pmatrix} 3 & -1 \\ -5 & 2 \end{pmatrix}$

C. $\begin{pmatrix} -1 & 2 \\ 3 & -5 \end{pmatrix}$

D.None of these

Answer:
To find adj A we will first find the cofactor matrix

$C_{11} = 3$ $C_{12} = -1$

$C_{21} = -5$ $C_{22} = 2$

Cofactor matrix A = $\begin{pmatrix} \mathbf{3} & \mathbf{-1} \\ \mathbf{-5} & \mathbf{2} \end{pmatrix}$

Adj A = $\begin{pmatrix} \mathbf{3} & \mathbf{-1} \\ \mathbf{-5} & \mathbf{2} \end{pmatrix}'$

= $\begin{pmatrix} \mathbf{3} & \mathbf{-5} \\ \mathbf{-1} & \mathbf{2} \end{pmatrix}$

Question 39.

If A = $\begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ and B is a square matrix of order 2 such that AB=I then B=?

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

B. $\begin{pmatrix} 1 & \frac{1}{2} \\ 2 & \frac{3}{2} \end{pmatrix}$

C. $\begin{pmatrix} 1 & 2 \\ \frac{1}{2} & \frac{3}{2} \end{pmatrix}$

D.None of these

Answer:

B=I

B = A^{-1} I ---------1

A^{-1}= $\frac{\mathbf{1}}{|\mathbf{A}|}$ adj A --------- 2

$|\mathbf{A}|$ = 3 x 2 – (-4) x (-1)

= 2

C_{11} = 2 C_{12} = 1

C_{21}= 4 C_{22} = 3

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

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

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

Putting in 2

$A^{-1} = \frac{1}{|2|}\begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$

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

Putting in 1

$B = A^{-1} I$

$= A^{-1}$

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

Question 40.
If A and B are invertible square matrices of the same order then $(AB)^{-1}$=?
A. AB^{-1}

B.$A^{-1}B$

C.$A^{-1}B^{-1}$

D.$B^{-1}A^{-1}$

Answer:
$(AB)(AB)^{-1} = I$

$A^{-1}(AB)(AB)^{-1} = IA^{-1}$

$(A^{-1}A)B\ (AB)^{-1} = A^{-1}$

$IB(AB)^{-1} = A^{-1}$

$B(AB)^{-1} = A^{-1}$

$B^{-1}B(AB)^{-1} = B^{-1}A^{-1}$

$I\ (AB)^{-1} = B^{-1}A^{-1}$

$(AB)^{-1} = B^{-1}A^{-1}$

Question 41.

If A=$\begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$, then A^{-1}=?

A. $\begin{pmatrix} \frac{3}{7} & \frac{-1}{7} \\ \frac{1}{7} & \frac{2}{7} \end{pmatrix}$

B. $\begin{pmatrix} \frac{3}{7} & \frac{1}{7} \\ \frac{-1}{7} & \frac{2}{7} \end{pmatrix}$

C. $\begin{pmatrix} \frac{1}{3} & \frac{1}{7} \\ \frac{1}{7} & \frac{2}{7} \end{pmatrix}$

D.None of these

Answer:

$^{-1}= \frac{\mathbf{1}}{|\mathbf{A}|}$ adj A --------- 1

$|\mathbf{A}|$ = 3 x 2 – (1) x (-1)

$=$ 7

C_{11} = 3 C_{12} = -1

C_{21}= 1 C_{22} = 2

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

Adj A =$\begin{pmatrix} \mathbf{3} & \mathbf{-1} \\ \mathbf{1} & \mathbf{2} \end{pmatrix}'$

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

Putting in 1

$A^{-1} = \frac{1}{|7|} \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$

$= \begin{pmatrix} \frac{3}{7} & \frac{1}{7} \\ \frac{-1}{7} & \frac{2}{7} \end{pmatrix}$

Question 42.

If $|A|=3$ and $A^{-1} = \begin{pmatrix} 3 & -1 \\ \frac{-5}{3} & \frac{2}{3} \end{pmatrix}$ then adj A=?

A. $\begin{pmatrix} 9 & 3 \\ -5 & -2 \end{pmatrix}$

B. $\begin{pmatrix} 9 & -3 \\ -5 & 2 \end{pmatrix}$

C. $\begin{pmatrix} -9 & 3 \\ 5 & -2 \end{pmatrix}$

D. $\begin{pmatrix} 9 & -3 \\ 5 & -2 \end{pmatrix}$

Answer:

$^{-1} = \frac{1}{|A|}$ adj A

adj A = $|A|$ x A^{-1}

$= 3 \times \begin{pmatrix} 3 & -1 \\ \frac{-5}{3} & \frac{2}{3} \end{pmatrix}$

$= \begin{pmatrix} 9 & -3 \\ -5 & 2 \end{pmatrix}$

Question 43.

If A is an invertible matrix and $A^{-1} = \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix}$ then A=?

A. $\begin{pmatrix} 6 & -4 \\ -5 & 3 \end{pmatrix}$

B. $\begin{pmatrix} \frac{1}{3} & \frac{1}{4} \\ \frac{1}{5} & \frac{1}{6} \end{pmatrix}$

C. $\begin{pmatrix} -3 & 2 \\ \frac{5}{2} & \frac{-3}{2} \end{pmatrix}$

D.None of these

Answer:
y property of inverse

$(A^{-1})^{-1} = A$

$(A^{-1})^{-1} = \begin{pmatrix} \mathbf{3} & \mathbf{4} \\ \mathbf{5} & \mathbf{6} \end{pmatrix}^{-1}$

$A = \begin{pmatrix} \mathbf{3} & \mathbf{4} \\ \mathbf{5} & \mathbf{6} \end{pmatrix}^{-1}$ ------------ 1

$|\mathbf{A}|^{-1} = 3 \times 6 - 4 \times 5$

$= -2$

$C_{11} = 6$ $C_{12} = -5$

$C_{21} = -4$ $C_{22} = 3$

Cofactor matrix A = $\begin{pmatrix} \mathbf{6} & \mathbf{-5} \\ \mathbf{-4} & \mathbf{3} \end{pmatrix}$

Adj A = $\begin{pmatrix} \mathbf{6} & \mathbf{-4} \\ \mathbf{-5} & \mathbf{3} \end{pmatrix}$

$\begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix}^{-1} = \frac{1}{-2}\begin{pmatrix} 6 & -4 \\ -5 & 3 \end{pmatrix}$

$= \begin{pmatrix} -3 & 2 \\ \frac{5}{2} & \frac{-3}{2} \end{pmatrix}$

Putting in 1

$A = \begin{pmatrix} -3 & 2 \\ \frac{5}{2} & \frac{-3}{2} \end{pmatrix}$

Question 44.

If $A=\begin{pmatrix} 1 & 2 \\ 4 & -3 \end{pmatrix}$ and $f(x)=2x^2 - 4x + 5$ then $f(A)$=?

A. $\begin{pmatrix} 19 & -32 \\ -16 & 51 \end{pmatrix}$

B. $\begin{pmatrix} 19 & -16 \\ -32 & 51 \end{pmatrix}$

C. $\begin{pmatrix} 19 & -11 \\ -27 & 51 \end{pmatrix}$

D. None of these

Answer:

$f(A) = 2A^2 - 4A + 5$

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

$= \begin{pmatrix} 9 & -4 \\ -8 & 17 \end{pmatrix}$

$f(A) = 2A^2 - 4A + 5I$

$= 2\begin{pmatrix} 9 & -4 \\ -8 & 17 \end{pmatrix} - 4\begin{pmatrix} 1 & 2 \\ 4 & -3 \end{pmatrix} + 5\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$= \begin{pmatrix} 18 & -8 \\ -16 & 34 \end{pmatrix} - \begin{pmatrix} 4 & 8 \\ 16 & -12 \end{pmatrix} + \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$

$= \begin{pmatrix} 19 & -16 \\ -32 & 51 \end{pmatrix}$

Question 45.

If A= $\begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$ then $A^2 - 4A = ?$

A. I

B. 5I

C. 3I

D. 0

Answer:

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

$= \begin{pmatrix} 9 & 16 \\ 8 & 17 \end{pmatrix}$

$A^2 - 4A = \begin{pmatrix} 9 & 16 \\ 8 & 17 \end{pmatrix} - 4\begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$

$= \begin{pmatrix} 9 & 16 \\ 8 & 17 \end{pmatrix} - \begin{pmatrix} 4 & 16 \\ 8 & 12 \end{pmatrix}$

$= \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$

$= 5 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

= 5I

Question 46.

If A is a 2-rowed square matrix and |A|=6 then $A \cdot \mathrm{adj} A$ =?

A. $\begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix}$

B. $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$

C. $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$

D. None of these

Answer:
(adj A) = |A|I

$= 6 \begin{pmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} \end{pmatrix}$

$= \begin{pmatrix} \mathbf{6} & \mathbf{0} \\ \mathbf{0} & \mathbf{6} \end{pmatrix}$

Question 47.
If A is an invertible square matrix and k is a non-negative real number then $(KA)^{-1}$=?

A. $k \cdot A^{-1}$

B. $\frac{1}{k} \cdot A^{-1}$

C. $-k \cdot A^{-1}$

D. None of these

Answer:
y the property of inverse

$(AB)^{-1} = B^{-1}A^{-1}$

$(KA)^{-1} = A^{-1}K^{-1}$

$= \frac{\mathbf{1}}{\mathbf{K}} A^{-1}$

Question 48.

If A= $\begin{pmatrix} 3 & 4 & 1 \\ 1 & 0 & -2 \\ -2 & -1 & 2 \end{pmatrix}$ then A^{-1}=?

A. $\begin{pmatrix} 2 & 9 & -8 \\ -2 & 8 & 7 \\ -1 & 5 & -4 \end{pmatrix}$

B. $\begin{pmatrix} -2 & 9 & -8 \\ 2 & 8 & 7 \\ -1 & -5 & 4 \end{pmatrix}$

C. $\begin{pmatrix} -2 & -9 & -8 \\ 2 & 8 & 7 \\ -1 & -5 & -4 \end{pmatrix}$

D. None of these

Answer:

$|\mathbf{A}|$ = 3 x (0 - 2) – 4 x (2-4)+1 x (-1)

= -6+8-1

= 1

C_{11} = -2 C_{12} = 2 C_{13}= -1

C_{21}= -9 C_{22} = 8 C_{23}= -5

C_{31}= -8 C_{32}=7 C_{33} =-4

Cofactor (A)= $\begin{bmatrix} \mathbf{-2} & \mathbf{2} & \mathbf{-1} \\ \mathbf{-9} & \mathbf{8} & \mathbf{-5} \\ \mathbf{-8} & \mathbf{7} & \mathbf{-4} \end{bmatrix}$

Adj A = $\begin{bmatrix} \mathbf{-2} & \mathbf{2} & \mathbf{-1} \\ \mathbf{-9} & \mathbf{8} & \mathbf{-5} \\ \mathbf{-8} & \mathbf{7} & \mathbf{-4} \end{bmatrix}'$

$$=\begin{bmatrix} -2 & -9 & -8 \\ 2 & 8 & 7 \\ -1 & -5 & -4 \end{bmatrix}$$

$A^{-1} = \frac{1}{|A|}$ adj A

$$=\frac{1}{1}\begin{bmatrix} -2 & -9 & -8 \\ 2 & 8 & 7 \\ -1 & -5 & -4 \end{bmatrix}$$

$$\begin{pmatrix} -2 & -9 & -8 \\ 2 & 8 & 7 \\ -1 & -5 & -4 \end{pmatrix}$$

Question 49.
If A is a square matrix then $(A + A')$ is
A. A null matrix

B. An identity matrix

C. A symmetric matrix

D. A skew-symmetric matrix

Answer:
Let $X = A+A'$

$X' = (A+A')'$

$= A' + (A')'$

$=A + A'$

$= X$

Therefore $(A+A')$ is symmetric matrix.

Question 50.
If A is a square matrix then $(A-A')$ is
A. A null matrix

B. An identity matrix

C. A symmetric matrix

D. A skew-symmetric matrix

Answer:
Let X = A-A′

X′ = (A-A′)′

= A′ - (A′)′

=A′ – A

= -(A – A′)

= -X

Therefore (A-A′) is skew symmetric matrix.

Question 51.
If A is a 3-rowed square matrix and |3A|=k |A| then k =?
A. 3 B.9

C. 27 D.1

Answer:
Since the matrix is of order 3 so 3 will be taken common from each row or column.

So, k= 27

Tagging

Question 52.
Which one of the following is a scalar matrix?
A. $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

B. $\begin{pmatrix} 6 & 0 \\ 0 & 3 \end{pmatrix}$

C. $\begin{pmatrix} -8 & 0 \\ 0 & -8 \end{pmatrix}$

D. None of these

Answer:

$= \begin{pmatrix} -8 & 0 \\ 0 & -8 \end{pmatrix}$

$= -8\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Since -8 could be taken common from each row or column. Hence C is a scalar matrix.

Question 53.

If A= $\begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$ and B= $\begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix}$ and

$(A + B)^2 = (A^2 + B^2)$ then

A. a = 2, b = -3

B. a = -2, b = 3

C. a = 1, b = 4

D. none of these

Answer:

$= \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$ B= $\begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix}$

A+B = $\begin{pmatrix} 1 + a & 0 \\ 2 + b & -2 \end{pmatrix}$

$(A+B)^2 = \begin{pmatrix} 1 + a & 0 \\ 2 + b & -2 \end{pmatrix}\begin{pmatrix} 1 + a & 0 \\ 2 + b & -2 \end{pmatrix}$

$= \begin{pmatrix} (1 + a)^2 & 0 \\ (2 + b)(1 + a) - 4 - 2b & -4 \end{pmatrix}$

$= \begin{pmatrix} (1 + a)^2 & 0 \\ 2 + 2a + b + ab - 4 - 2b & 4 \end{pmatrix}$

$= \begin{pmatrix} (1+a)^2 & 0 \\ 2a+ab-b-2 & 4 \end{pmatrix}$

$A^2 = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$

$= \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

$B^2 = \begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix} \begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix}$

$= \begin{pmatrix} a^2+b & a-1 \\ ab-b & b+1 \end{pmatrix}$

$(A + B)^2 = (A^2 + B^2)$

$\begin{pmatrix} (1+a)^2 & 0 \\ 2a+ab-b-2 & 4 \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} + \begin{pmatrix} a^2+b & a-1 \\ ab-b & b+1 \end{pmatrix}$

$= \begin{pmatrix} -1+a^2+b & a-1 \\ ab-b & b \end{pmatrix}$

By comparison,

a-1 = 0

a=1

b=4