NDA 2 2024

LIVE

MATHS

MATRICES & DETERMINANTS

CLASS 3

NAVJYOTI SIR

18 June 2024 Live Classes Schedule

8:00AM	18 JUNE 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	18 JUNE 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

AFCAT 2 2024 LIVE CLASSES

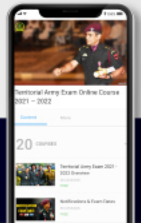
2:30PM	STATIC GK - SCIENTIFIC INVENTIONS	DIVYANSHU SIR
4:00PM	MATHS - GEOMETRY - CLASS 3	NAVJYOTI SIR

NDA 2 2024 LIVE CLASSES

11:30AM	GK - HUMAN GEOGRAPHY	RUBY MA'AM
2:30PM	GS - CHEMISTRY - CLASS 7	SHIVANGI MA'AM
6:30PM	MATHS - MATRICES & DETERMINANTS - CLASS 3	NAVJYOTI SIR

CDS 2 2024 LIVE CLASSES

11:30AM	GK - HUMAN GEOGRAPHY	RUBY MA'AM
2:30PM	GS - CHEMISTRY - CLASS 7	SHIVANGI MA'AM
4:00PM	MATHS - GEOMETRY - CLASS 3	NAVJYOTI SIR



CRAMER's RULE

$(x=1,\ y=-1,\ z=2)$

$1x + 1y + 1z = 2$

$2x + y + z = 3$

$x - 2y - z = 1$

$$D = \begin{vmatrix} 1 & 1 & 1 \\ 2 & 1 & 1 \\ 1 & -2 & -1 \end{vmatrix} = 1(-1+2) - 1(-2-1) + 1(-4-1)$$

$$= 1 + 3 - 5 = 4 - 5 = -1$$

(coeff. of each linear eqn)

$$x = \frac{D_1}{D} = \frac{-1}{-1} = 1$$

$$D_1 = \begin{vmatrix} 2 & 1 & 1 \\ 3 & 1 & 1 \\ 1 & -2 & -1 \end{vmatrix} = 2(-1+2) - 1(-3-1) + 1(-6-1)$$

$$= 2 + 4 - 7 = -1$$

$$y = \frac{D_2}{D}$$

$$D_2 = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & -1 \end{vmatrix} =$$

$$D_3 = \begin{vmatrix} 1 & 1 & 2 \\ 2 & 1 & 3 \\ 1 & -2 & 1 \end{vmatrix} =$$

$$z = \frac{D_3}{D} =$$

$D = -1$

$$D_3 = \begin{vmatrix} 1 & 1 & 2 \\ 2 & 1 & 3 \\ 1 & -2 & 1 \end{vmatrix} = 1 \times 7 - 1(-1) + 2(-5)$$

$$= 7 + 1 - 10 = 8 - 10 = -2$$

$$z = \frac{D_3}{D} = \frac{-2}{-1} = 2$$

RESULTS – CONSISTENCY AND INCONSISTENCY

unique soln.

- Matrix method → $|A| \neq 0$
- Cramer's rule → $D \neq 0$

infinitely many

- $|A| = 0$, $(\text{adj}A)B = 0$
- $D = 0$, $D_1 = D_2 = D_3 = 0$

no soln.

- $|A| = 0$, $(\text{adj}A)B \neq 0$
- $D = 0$, D_1, D_2, D_3 are not all zero, or atleast one is non-zero.

TRIVIAL SOLUTION (consistent)

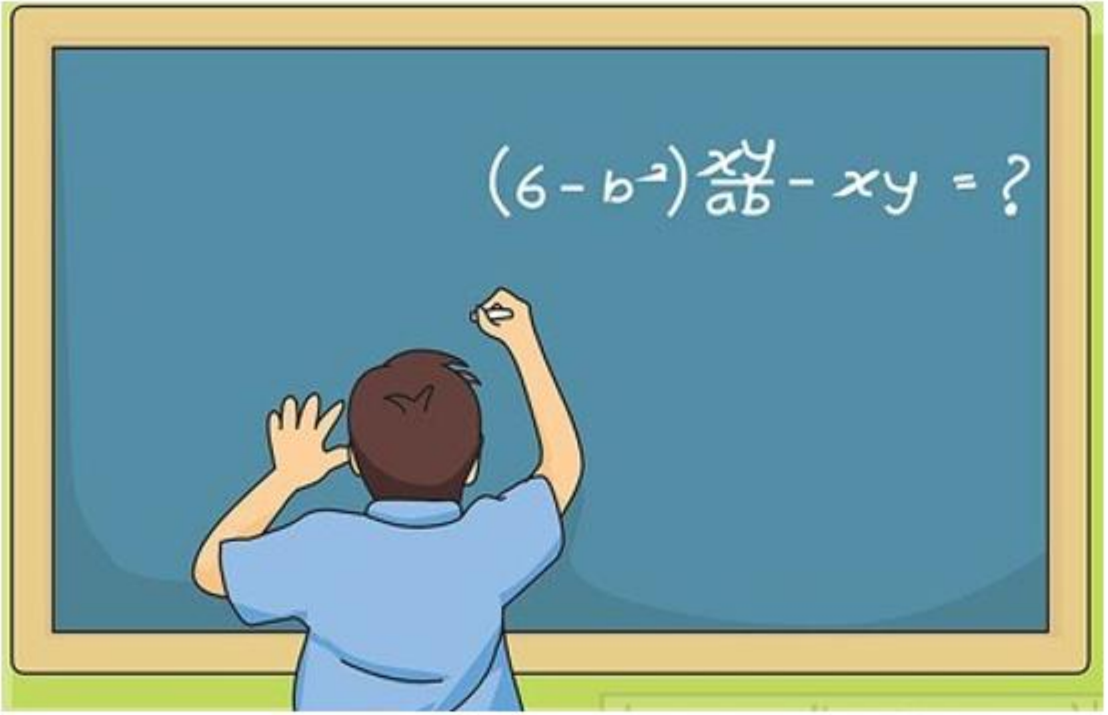
Matrix- method, $x = y = z = 0$

$|A| \neq 0$; $(adj A) B = 0$

Cramer's rule

$D \neq 0$; $D_1 = D_2 = D_3 = 0$

PRACTISE TIME !



Q) If $l + m + n = 0$, then the system of equations

$$-2x + y + z = l$$
$$x - 2y + z = m$$
$$x + y - 2z = n$$

has

(a) a trivial solution ✗ (b) no solution

(c) a unique solution ✗ (d) infinitely many solutions

$$\begin{vmatrix} -2 & 1 & 1 \\ 1 & -2 & 1 \\ 1 & 1 & -2 \end{vmatrix} =$$

$$-2(3) - 1(-3) + 1(1+2)$$

$$-6 + 3 + 3 = \underline{0}$$

$\underline{\text{adj}A} \rightarrow$

$$\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}\begin{bmatrix} l \\ m \\ n \end{bmatrix} = 3\begin{bmatrix} l+m+n \\ l+m+n \\ l+m+n \end{bmatrix} = 3\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = 0$$

$(\text{adj}A)(B) = 0 \Rightarrow$ infinitely many solutions

NDA 2 2024 LIVE CLASS - MATHS - PART 3

If $l + m + n = 0$, then the system of equations

$$-2x + y + z = l$$
$$x - 2y + z = m$$
$$x + y - 2z = n$$

has

(a) a trivial solution (b) no solution

(c) a unique solution (d) infinitely many solutions ✓

$$D_1 = \begin{bmatrix} l & 1 & 1 \\ m & -2 & 1 \\ n & 1 & -2 \end{bmatrix} = l(3) - m(-3) + n(3)$$
$$= 3l + 3m + 3n = 0$$

$D_2 = 0$

$D_3 = 0$

$D = 0$

$D_1 = D_2 = D_3 = 0$

$\Rightarrow$

Q) If $l + m + n = 0$, then the system of equations

$$-2x + y + z = l$$
$$x - 2y + z = m$$
$$x + y - 2z = n$$

has

(a) a trivial solution (b) no solution

(c) a unique solution (d) infinitely many solutions

Ans: (d)

SSBCrack EXAMS

Q) Consider the following statements in respect of symmetric matrices A and B

1. AB is symmetric. ✗
2. $A^2 + B^2$ is symmetric. ✓

Which of the above statement(s) is/are correct?

(a) 1 only
(b) 2 only ✓
(c) Both 1 and 2
(d) Neither 1 nor 2

$A^T = A$; $B^T = B$

① $(AB)^T = AB$

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

$= BA$

Since, $AB \neq BA$,

② $(A^2 + B^2)^T = A^2 + B^2$

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

$= A^2 + B^2 = RHS$

$\left((M+N)^T = M^T + N^T \right)$

Q) Consider the following statements in respect of symmetric matrices A and B

1. AB is symmetric.
2. $A^2 + B^2$ is symmetric.

Which of the above statement(s) is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Ans: (b)

Q) If $A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, where ω is cube root of unity, then what is A^{100} equal to?

(a) A ✓ (b) $-A$

(c) Null matrix (d) Identity matrix

$$A^2 = A \cdot A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}\begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix}$$

$$A^3 = A^2 \cdot A = \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix}\begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = \begin{bmatrix} \omega^3 & 0 \\ 0 & \omega^3 \end{bmatrix}$$

$$A^{100} = \begin{bmatrix} \omega^{100} & 0 \\ 0 & \omega^{100} \end{bmatrix} = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = A$$

$$\omega^{100} = \omega^{3 \times 33 + 1} = \omega^1 = \omega$$

Q) If $A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, where ω is cube root of unity, then what is A^{100} equal to?

(a) A

(b) $-A$

(c) Null matrix

(d) Identity matrix

Ans: (a)

Q) A matrix X has $(a+b)$ rows and $(a+2)$ columns; and a matrix Y has $(b+1)$ rows and $(a+3)$ columns. If both XY and YX exist, then what are the values of a, b respectively?

(a) 3, 2
(b) 2, 3
(c) 2, 4
(d) 4, 3

X: $(a+b) \times (a+2)$

Y: $(b+1) \times (a+3)$

$XY \rightarrow a+2 = b+1 \Rightarrow a-b = -1$

$YX \rightarrow a+b = a+3 \Rightarrow b = 3$

Q) A matrix X has $(a+b)$ rows and $(a+2)$ columns; and a matrix Y has $(b+1)$ rows and $(a+3)$ columns. If both XY and YX exist, then what are the values of a, b respectively?

(a) 3, 2 (b) 2, 3

(c) 2, 4 (d) 4, 3

Ans: (b)

Q) If $f(x)=\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$

What is the maximum value of f(x)?

(a) 2 (b) 4

(c) 6 (d) 8

$C_1 \to C_1 + C_2$

$$\begin{vmatrix} 2 & \cos^2 x & 4\sin 2x \\ 2 & 1+\cos^2 x & 4\sin 2x \\ 1 & \cos^2 x & 1+4\sin 2x \end{vmatrix}$$

$R_2 \to R_2 - R_1 \qquad R_3 \to R_3 - R_2$

$$\begin{vmatrix} 2 & \cos^2 x & 4\sin 2x \\ 0 & 1 & 0 \\ -1 & -1 & 1 \end{vmatrix}$$

$= 1(2 - (-4\sin 2x))$

$f(x) = 2 + 4\sin 2x$

Max. value $= 2 + 4(1) = 6$

(As max. value of $\sin\theta = 1$)

Q) If $f(x) = \begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$

What is the maximum value of $f(x)$?

(a) 2 (b) 4

(c) 6 (d) 8

Ans: (c)

Q) For a square matrix A, which of the following properties hold?

1. $(A^{-1})^{-1} = A$
2. $\det(A^{-1}) = \dfrac{1}{\det A}$
3. $(\lambda A)^{-1} = \lambda A^{-1}$, where λ is a scalar

Select the correct answer using the code given below.

(a) 1 and 2 (b) 2 and 3 (c) 1 and 3 (d) 1, 2 and 3

Q) For a square matrix A, which of the following properties hold?

1. $(A^{-1})^{-1} = A$
2. $\det(A^{-1}) = \dfrac{1}{\det A}$
3. $(\lambda A)^{-1} = \lambda A^{-1}$, where λ is a scalar

Select the correct answer using the code given below.

(a) 1 and 2 (b) 2 and 3 (c) 1 and 3 (d) 1, 2 and 3

Ans: (d)

Q) The system of equations

$$2x + y - 3z = 5$$

$$3x - 2y + 2z = 5 \text{ and } 5x - 3y - z = 16$$

(a) is inconsistent

(b) is consistent, with a unique solution ✓

(c) is consistent, with infinitely many solutions

(d) has its solution lying along X-axis in three-dimensional space

$$\begin{vmatrix} 2 & 1 & -3 \\ 3 & -2 & 2 \\ 5 & -3 & -1 \end{vmatrix} = 2(8) - 1(-13) - 3(-9+10)$$

$$= 16 + 13 - 3(1)$$

$$\neq 0$$

Q) The system of equations

$$2x + y - 3z = 5$$

$$3x - 2y + 2z = 5 \text{ and } 5x - 3y - z = 16$$

(a) is inconsistent
(b) is consistent, with a unique solution
(c) is consistent, with infinitely many solutions
(d) has its solution lying along X-axis in three-dimensional space

Ans: (b)

Q) If $\Delta = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}$

then what is

$$\begin{vmatrix} 3d+5g & 4a+7g & 6g \\ 3e+5h & 4b+7h & 6h \\ 3f+5i & 4c+7i & 6i \end{vmatrix}$$ equal to?

(a) Δ (b) 7Δ

(c) 72Δ (d) -72Δ ✓

$$6\begin{vmatrix} 3d+5g & 4a+7g & g \\ 3e+5h & 4b+7h & h \\ 3f+5i & 4c+7i & i \end{vmatrix}$$

$C_1 \to C_1 - 5C_3$ $C_2 \to C_2 - 7C_3$

$$= 6\begin{vmatrix} 3d & 4a & g \\ 3e & 4b & h \\ 3f & 4c & i \end{vmatrix}$$

$$= 6 \times 3 \times 4 \begin{vmatrix} d & a & g \\ e & b & h \\ f & c & i \end{vmatrix}$$

$$= -(6 \times 3 \times 4)\begin{vmatrix} a & d & g \\ b & e & h \\ c & f & i \end{vmatrix}$$

$$= -72\Delta$$

Q) If $\Delta = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}$

then what is

$$\begin{vmatrix} 3d+5g & 4a+7g & 6g \\ 3e+5h & 4b+7h & 6h \\ 3f+5i & 4c+7i & 6i \end{vmatrix}$$ equal to?

(a) Δ (b) 7Δ

(c) 72Δ (d) -72Δ

Ans: (d)

Q) If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$,

where $a \in \mathbb{N}$, then what is $A^{100} - A^{50} - 2A^{25}$ equal to?

(a) $-2I$ ✓
(b) $-I$
(c) $2I$
(d) I

where I is the identity matrix.

$$A^2 = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 2a \\ 0 & 1 \end{bmatrix}$$

$$A^3 = A^2 \cdot A = \begin{bmatrix} 1 & 2a \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3a \\ 0 & 1 \end{bmatrix}$$

$$A^n = \begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$$

$$A^{100} = \begin{bmatrix} 1 & 100a \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 1 & 50a \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 50a \\ 0 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 1-1-2 & 100a - 50a - 50a \\ 0-0-0 & 1-1-2 \end{bmatrix}$$

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

$$= -2I$$

SSBCrack EXAMS

Q) If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$,

where $a \in \mathbb{N}$, then what is $A^{100} - A^{50} - 2A^{25}$ equal to?

(a) $-2I$ (b) $-I$

(c) $2I$ (d) I

where I is the identity matrix.

Ans: (a)

Q) If A and B are square matrices of order 2 such that $\det(AB) = \det(BA)$, then which one of the following is correct?

(a) A must be a unit matrix

(b) B must be a unit matrix

(c) Both A and B must be unit matrices

(d) A and B need not be unit matrices

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(c) Both A and B must be unit matrices

(d) A and B need not be unit matrices

Ans: (d)

SSBCrack EXAMS

Q) If α and β are the roots of the equation $1 + x + x^2 = 0$, then the matrix product $\begin{bmatrix} 1 & \beta \\ \alpha & \alpha \end{bmatrix}\begin{bmatrix} \alpha & \beta \\ 1 & \beta \end{bmatrix}$ is equal to

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} -1 & -1 \\ -1 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} -1 & -1 \\ -1 & -2 \end{bmatrix}$

$x^2 + x + 1 = 0$

α, β

$\alpha = \omega$

$\beta = \omega^2$

Q) If α and β are the roots of the equation $1 + x + x^2 = 0$, then the matrix product $\begin{bmatrix} 1 & \beta \\ \alpha & \alpha \end{bmatrix}\begin{bmatrix} \alpha & \beta \\ 1 & \beta \end{bmatrix}$ is equal to

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} -1 & -1 \\ -1 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} -1 & -1 \\ -1 & -2 \end{bmatrix}$

Ans: (b)

Q) What is the value of the following determinant?

$$\begin{vmatrix} \cos C & \tan A & 0 \\ \sin B & 0 & -\tan A \\ 0 & \sin B & \cos C \end{vmatrix}$$

(a) -1

(b) 0

(c) $2 \tan A \sin B \sin C$

(d) $-2 \tan A \sin B \sin C$

Q) What is the value of the following determinant?

$$\begin{vmatrix} \cos C & \tan A & 0 \\ \sin B & 0 & -\tan A \\ 0 & \sin B & \cos C \end{vmatrix}$$

(a) – 1

(b) 0

(c) $2 \tan A \sin B \sin C$

(d) $-2 \tan A \sin B \sin C$

Ans: (b)

Q) The value of the determinant $\begin{vmatrix} 1-\alpha & \alpha-\alpha^2 & \alpha^2 \\ 1-\beta & \beta-\beta^2 & \beta^2 \\ 1-\gamma & \gamma-\gamma^2 & \gamma^2 \end{vmatrix}$

is equal to

(a) $(\alpha-\beta)(\beta-\gamma)(\alpha-\gamma)$ ✓(b) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

(c) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$

(d) 0

$$\begin{vmatrix} 1 & \alpha & \alpha^2 \\ 1 & \beta & \beta^2 \\ 1 & \gamma & \gamma^2 \end{vmatrix}$$

$$\begin{vmatrix} 1 & \alpha & \alpha^2 \\ 0 & \alpha-\beta & (\alpha+\beta)(\alpha-\beta) \\ 0 & \beta-\gamma & (\beta+\gamma)(\beta-\gamma) \end{vmatrix}$$

$$= (\alpha-\beta)(\beta-\gamma)[\beta+\gamma-\alpha-\beta]$$

$$= (\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$$

Q) The value of the determinant $\begin{vmatrix} 1-\alpha & \alpha-\alpha^2 & \alpha^2 \\ 1-\beta & \beta-\beta^2 & \beta^2 \\ 1-\gamma & \gamma-\gamma^2 & \gamma^2 \end{vmatrix}$

is equal to

(a) $(\alpha-\beta)(\beta-\gamma)(\alpha-\gamma)$ (b) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

(c) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$

(d) 0

Ans: (b)

SSBCrack EXAMS

Q) What is the value of the determinant

$$\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix}?$$

(a) 0
(b) 12
(c) 24
(d) 36

$$\begin{vmatrix} 1 & 2 & 6 \\ 2 & 6 & 24 \\ 6 & 24 & 120 \end{vmatrix}$$

Q) What is the value of the determinant

$$\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix} ?$$

(a) 0 (b) 12
(c) 24 (d) 36

Ans: (c)

Q) The inverse of a matrix A is given by $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

What is A equal to?

(a) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$

(d) $\begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$

Q) The inverse of a matrix A is given by $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

What is A equal to?

(a) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$

(d) $\begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$

Ans: (a)

Q) For what values of k, does the system of linear equations

$$x+y+z=2,\ 2x+y-z=3,\ 3x+2y+kz=4$$

have a unique solution ?

(a) $k=0$

(b) $-1<k<1$

(c) $-2<k<2$

(d) $k \neq 0$

Q) For what values of k, does the system of linear equations

$$x+y+z=2,\ 2x+y-z=3,\ 3x+2y+kz=4$$

have a unique solution ?

(a) $k=0$ (b) $-1<k<1$

(c) $-2<k<2$ (d) $k\neq 0$

Ans: (d)

Q) If $x + a + b + c = 0$, then what is the value of $\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix}$?

(a) 0
(b) $(a + b + c)^2$
(c) $a^2 + b^2 + c^2$
(d) $a + b + c - 2$

Q) If $x + a + b + c = 0$, then what is the value of $\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix}$?

(a) 0
(b) $(a + b + c)^2$
(c) $a^2 + b^2 + c^2$
(d) $a + b + c - 2$

Ans: (a)

Q) What is the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ if $a^3 + b^3 + c^3 = 0$?

(a) 0 (b) 1

(c) 3 abc (d) – 3 abc

Q) What is the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ if $a^3 + b^3 + c^3 = 0$?

(a) 0 (b) 1

(c) 3 abc (d) – 3 abc

Ans: (c)

Q) If $1, \omega, \omega^2$ are the cube roots of unity, then

$$\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix} \text{ is equal to}$$

(a) ω^2 (b) 0 (c) 1 (d) ω

Q) If $1, \omega, \omega^2$ are the cube roots of unity, then

$$\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix} \text{ is equal to}$$

(a) ω^2 (b) 0 (c) 1 (d) ω

Ans: (b)

Q) Let A be an $n \times n$ matrix. If $\det(\lambda A) = \lambda^s \det(A)$, what is the value of s?

(a) 0
(b) 1
(c) –1
(d) n

Q) Let A be an $n \times n$ matrix. If $\det(\lambda A) = \lambda^s \det(A)$, what is the value of s?

(a) 0 (b) 1

(c) -1 (d) n

Ans: (d)

Q) If a matrix A is such that

$$3A^3 + 2A^2 + 5A + I = 0,$$

Then what is A^{-1} equal to?

(a) $-(3A^2 + 2A + 5)$

(b) $3A^2 + 2A + 5I$

(c) $3A^2 - 2A - 5I$

(d) $(3A^2 + 2A - 5I)$

Q) If a matrix A is such that

$$3A^3 + 2A^2 + 5A + I = 0,$$

Then what is A^{-1} equal to?

(a) $-(3A^2 + 2A + 5)$ (b) $3A^2 + 2A + 5I$

(c) $3A^2 - 2A - 5I$ (d) $(3A^2 + 2A - 5I)$

Ans: (a)

Q) If A is an invertible matrix of order n and k is any positive real number, then the value of $[\det(kA)]^{-1} \det A$ is

(a) k^{-n}

(b) k^{-1}

(c) k^{n}

(d) nk

Q) If A is an invertible matrix of order n and k is any positive real number, then the value of $[\det(kA)]^{-1} \det A$ is

(a) k^{-n}

(b) k^{-1}

(c) k^{n}

(d) nk

Ans: (a)

Q) If A is a square matrix, then what is $\text{adj}(A^{-1}) - (\text{adj } A)^{-1}$ equal to?

(a) $2|A|$ (b) Null matrix
(c) Unit matrix (d) None of the above

Q) If A is a square matrix, then what is $\text{adj}(A^{-1}) - (\text{adj } A)^{-1}$ equal to?

(a) $2|A|$
(b) Null matrix
(c) Unit matrix
(d) None of the above

Ans: (b)

Q) Consider the following in respect of the matrix

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

1. $A^2 = -A$
2. $A^3 = 4A$

Which of the above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Q) Consider the following in respect of the matrix

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

1. $A^2 = -A$
2. $A^3 = 4A$

Which of the above is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Ans: (b)

Q) Let $A = \begin{pmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{pmatrix}$. The only correct statement about the matrix A is

(a) $A^2 = I$

(b) $A = (-1)\,I$, where I is a unit matrix

(c) A^{-1} does not exist

(d) A is a zero matrix

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Ans: (a)

Q) If $a_1, a_2, a_3, \ldots\ldots, a_n, \ldots.$ are in G.P., then the value of the determinant

$$\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}, \text{ is}$$

(a) -2 (b) 1 (c) 2 (d) 0

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Ans: (d)

Q) The system of equations

$$\alpha x + y + z = \alpha - 1$$
$$x + \alpha y + z = \alpha - 1$$
$$x + y + \alpha z = \alpha - 1$$

has infinite solutions, if α is

(a) -2

(b) either -2 or 1

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(d) 1

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(b) either -2 or 1
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Ans: (a)

Q) If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A-B)(A+B)$, then which of the following will be always true?

(a) $A = B$

(b) $AB = BA$

(c) either of A or B is a zero matrix

(d) either of A or B is identity matrix

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Ans: (b)

Q) Let $A=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}$ and $B=\begin{pmatrix}a & 0\\ 0 & b\end{pmatrix}$, $a, b \in N$. Then

(a) there cannot exist any B such that AB = BA

(b) there exist more then one but finite number of B′s such that AB = BA

(c) there exists exactly one B such that AB = BA

(d) there exist infinitely many B′s such that AB = BA

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(d) there exist infinitely many B′s such that AB = BA

Ans: (d)

Q) Let $A = \begin{vmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{vmatrix}$. If $\left|A^2\right| = 25$, then $|\alpha|$ equals

(a) $1/5$ (b) 5 (c) 5^2 (d) 1

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Ans: (a)

Q) Let A be a 2×2 matrix

Statement -1 : adj (adj A) = A

Statement -2 : $|\text{adj } A| = |A|$

(a) Statement-1 is true, Statement-2 is true. Statement-2 is not a correct explanation for Statement-1.

(b) Statement-1 is true, Statement-2 is false.

(c) Statement -1 is false, Statement-2 is true.

(d) Statement-1 is true, Statement -2 is true. Statement-2 is a correct explanation for Statement-1.

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Ans: (d)

Q) Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$. and $10B = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$. If B is the inverse of matrix A, then α is

(a) 5 (b) –1 (c) 2 (d) –2

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Ans: (a)

Q) Let A and B be two symmetric matrices of order 3.

Statement-1: $A(BA)$ and $(AB)A$ are symmetric matrices.

Statement-2: AB is symmetric matrix if matrix multiplication of A with B is commutative.

(a) Statement-1 is true, Statement-2 is true; Statement-2 is **not a** correct explanation for Statement-1.

(b) Statement-1 is true, Statement-2 is false.

(c) Statement-1 is false, Statement-2 is true.

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Ans: (a)

Q) If $\alpha, \beta \neq 0$, and $f(n) = \alpha^n + \beta^n$ and

$$\begin{vmatrix} 3 & 1+f(1) & 1+f(2) \\ 1+f(1) & 1+f(2) & 1+f(3) \\ 1+f(2) & 1+f(3) & 1+f(4) \end{vmatrix}$$

$= K(1-\alpha)^2(1-\beta)^2(\alpha-\beta)^2$, then K is equal to:

(a) 1 (b) -1 (c) $\alpha\beta$ (d) $\dfrac{1}{\alpha\beta}$

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Ans: (a)

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Q) If $A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and $A \text{ adj } A = A A^T$, then $5a + b$ is equal to :

(a) 4

(b) 13

(c) –1

(d) 5

Q) If $A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and $A \text{ adj } A = A A^T$, then $5a + b$ is equal to :

(a) 4 (b) 13

(c) –1 (d) 5

Ans: (d)

Q) If A and B are square matrices of equal degree, then which one is correct among the followings?

(a) $A+B=B+A$

(b) $A+B=A-B$

(c) $A-B=B-A$

(d) $AB=BA$

Q) If A and B are square matrices of equal degree, then which one is correct among the followings?

(a) $A + B = B + A$

(b) $A + B = A - B$

(c) $A - B = B - A$

(d) $AB = BA$

Ans: (a)

Q) If A is a 3×3 non-singular matrix such that $AA' = A'A$ and $B = A^{-1}A'$, then BB' equals:

(a) B^{-1} (b) $\left(B^{-1}\right)'$ (c) $I + B$ (d) I

Q) If A is a 3×3 non-singular matrix such that $AA' = A'A$ and $B = A^{-1}A'$, then BB' equals:

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Ans: (d)

Q) If $A^2 - A + I = 0$, then the inverse of A is

(a) $A+I$ (b) A (c) $A-I$ (d) $I-A$

Q) If $A^2 - A + I = 0$, then the inverse of A is

(a) $A+I$ (b) A (c) $A-I$ (d) $I-A$

Ans: (d)

Q) If $a^2+b^2+c^2=-2$ and

$$f(x)=\begin{vmatrix} 1+a^2x & (1+b^2)x & (1+c^2)x \\ (1+a^2)x & 1+b^2x & (1+c^2)x \\ (1+a^2)x & (1+b^2)x & 1+c^2x \end{vmatrix},$$

then f(x) is a polynomial of degree

(a) 1 (b) 0 (c) 3 (d) 2

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(a) 1 (b) 0 (c) 3 (d) 2

Ans: (d)


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