NDA 1 2025

LIVE

MATHS

MATRICES & DETERMINANTS - 2

MCQS

NAVJYOTI SIR

11 Feb 2025 Live Classes Schedule

9:00AM	11 FEBRUARY 2025 DAILY DEFENCE UPDATES	DIVYANSHU SIR
10:00AM	11 FEBRUARY 2025 DAILY CURRENT AFFAIRS	RUBY MA'AM

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF SRT & SDT	ANURADHA MA'AM

AFCAT 1 2025 LIVE CLASSES

3:00PM	STATIC GK - SCIENTIFIC INVENTIONS	DIVYANSHU SIR
4:30PM	ENGLISH - CLOZE TEST - CLASS 1	ANURADHA MA'AM
5:30PM	MATHS - PROGRESSIONS	NAVJYOTI SIR

NDA 1 2025 LIVE CLASSES

10:00AM	MATHS - MATRICES & DETERMINANTS - CLASS 2	NAVJYOTI SIR
11:30AM	POLITY - CLASS 4	RUBY MA'AM
1:00PM	BIOLOGY - CLASS 2	SHIVANGI MA'AM
4:30PM	ENGLISH - CLOZE TEST - CLASS 1	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	POLITY - CLASS 4	RUBY MA'AM
1:00PM	BIOLOGY - CLASS 2	SHIVANGI MA'AM
4:30PM	ENGLISH - CLOZE TEST - CLASS 1	ANURADHA MA'AM

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

$\det(\lambda A) = \lambda^n \det(A)$ — order

$\lambda^s \det(A) = \lambda^n \det(A)$

$s = n$

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

pre-multiplying with A^{-1},

$$A^{-1}(3A^3 + 2A^2 + 5A + I) = A^{-1}(0)$$

$$3(A^{-1})(A^3) + 2(A^{-1})(A^2) + 5(A^{-1})(A) + A^{-1}(I) = 0$$

$$3A^2 + 2A + 5 + A^{-1} = 0 \Rightarrow A^{-1} = -(3A^2 + 2A + 5)$$

SSBCrack EXAMS

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

$[k^n \det(A)]^{-1} \det A$

$= k^{-n} [\det(A)]^{-1} (\det A) = k^{-n} \times \frac{1}{|A|} \times |A|$

$= k^{-n}$

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

$$\text{adj}(A^{-1}) = (\text{adj } A)^{-1}$$

$$\text{adj}(A^{n}) = (\text{adj } A)^{n}$$

$$\text{adj}(A^{-1}) - (\text{adj } A)^{-1} = 0$$

→ null matrix

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

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

$= 2(-A)$

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

$$= \begin{bmatrix} -4 & 4 \\ 4 & -4 \end{bmatrix} = 4 \begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix} = \underline{4A}$$

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

(a) $A^2 = I$

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

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

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

3 consecutive terms

$\log a_n, \log a_{n+1}, \log a_{n+2}$ are in AP.

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

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

$C_2 \to C_2 - (C_1 + C_3)$

$$= \frac{1}{2}\begin{vmatrix} \log a_n & 0 & \log a_{n+2} \\ \log a_{n+3} & 0 & \log a_{n+5} \\ \log a_{n+6} & 0 & \log a_{n+8} \end{vmatrix} = 0$$

If a, b, c are in AP,

$2b = a + c$

$2b - (a+c) = 0$

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

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

(c) not -2 (d) 1

$$\begin{bmatrix} \alpha & 1 & 1 \\ 1 & \alpha & 1 \\ 1 & 1 & \alpha \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \alpha - 1 \\ \alpha - 1 \\ \alpha - 1 \end{bmatrix}$$

(A) (B)

For infinite solutions, $|A| = 0$ & $(\text{adj} A)B = 0$

$$|A| = 0$$

$$\begin{vmatrix} \alpha & 1 & 1 \\ 1 & \alpha & 1 \\ 1 & 1 & \alpha \end{vmatrix} = 0$$

$$\alpha(\alpha^2 - 1) - 1(\alpha - 1) + 1(1 - \alpha) = 0$$

$$\alpha^3 - \alpha - \alpha + 1 + 1 - \alpha = 0$$

$$\alpha^3 - 3\alpha + 2 = 0$$

$$\alpha^3 - 3\alpha + 2 = 0$$

$$(\alpha - 1)(\alpha^2 + \alpha - 2) = 0$$

$$\begin{array}{r|l} & \alpha^2 + \alpha - 2 \\ \alpha - 1 & \alpha^3 - 3\alpha + 2 \\ & \alpha^3 - \alpha^2 \\ \hline & \alpha^2 - 3\alpha \\ & \alpha^2 - \alpha \\ & (+) \\ \hline & -2\alpha + 2 \end{array}$$

$$(\alpha-1)(\alpha^2+\alpha-2)=0$$

$$(\alpha-1)(\alpha-1)(\alpha+2)=0$$

$$\alpha = 1, 1, -2$$

If $\alpha = 1$, system of eqns will become homogeneous, then there are no infinite solns.

$\alpha = 1$ (rejected)

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
(c) not -2
(d) 1

Ans: (a)

SSBCrack EXAMS

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

$(A-B)(A+B)$

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

$\Rightarrow AB - BA = 0$

$\Rightarrow AB = BA$

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

Ans: (b)

SSBCrack EXAMS

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 ✓

$\begin{bmatrix} n & 0 \\ 0 & n \end{bmatrix} = n \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = nI$

AB = BA for $a = b = n$ & $B = nI$ where $n \in N$.

$AB = A(nI) = nAI = nA$

$BA = (nI)A = nIA = nA$

$(AI = IA = A)$

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

Ans: (d)

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

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

$|A^n| = |A|^n$

$|A^2| = 25$

$|A|^2 = 25$

$[5(5\alpha)]^2 = 25$

$625\alpha^2 = 25$

$\alpha^2 = \frac{1}{25}$

$\alpha = \frac{1}{5}$ or $\alpha = -\frac{1}{5}$

$|\alpha| = \frac{1}{5}$

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

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

Ans: (a)

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

$$B = \frac{1}{10}\begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$$

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

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

$$\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}\begin{bmatrix} \frac{4}{10} & \frac{2}{10} & \frac{2}{10} \\ \frac{-5}{10} & 0 & \frac{\alpha}{10} \\ \frac{1}{10} & \frac{-2}{10} & \frac{3}{10} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} \frac{4}{10} & \frac{2}{10} & \frac{2}{10} \\ \frac{-5}{10} & 0 & \frac{\alpha}{10} \\ \frac{1}{10} & \frac{-2}{10} & \frac{3}{10} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\frac{2}{10} - \frac{\alpha}{10} + \frac{3}{10} = 0$$

$$2 - \alpha + 3 = 0$$

$$\boxed{\alpha = 5}$$

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

Ans: (a)

SSBCrack EXAMS

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.

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

$(PQ)^T = Q^T P^T$

① $[A(BA)]^T = (BA)^T . A^T$

$= A^T B^T . A^T$

$= AB . A$ → symmetric

$[(AB)A]^T$

$= A^T (AB)^T$

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

$= (AB)A$

$A^T = A$

$B^T = B$

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

$= AB$ (only when $\underline{AB = BA}$)

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

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(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.

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) $\dfrac{1}{\alpha\beta}$

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) $\dfrac{1}{\alpha\beta}$

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:

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

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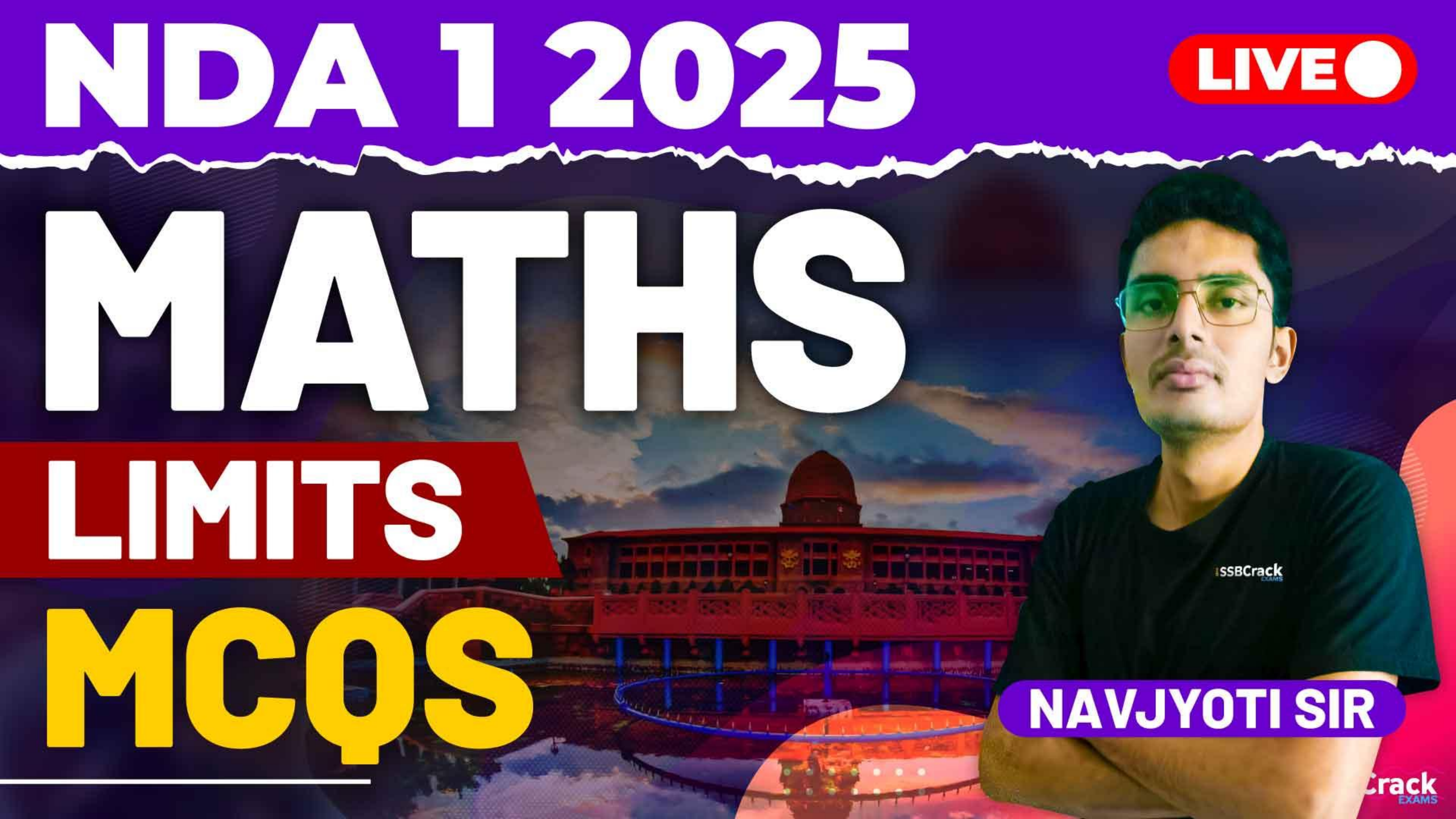
$$f(x) = \begin{vmatrix} 1+a^2x & (1+b^2)x & (1+c^2)x \\ (1+a^2)x & 1+b^2x & (1+c^2)x \\ (1+a^2)x & (1+b^2)x & 1+c^2x \end{vmatrix},$$

then f(x) is a polynomial of degree

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

Ans: (d)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