NDA 1 2025

LIVE

MATHS

MATRICES & DETERMINANTS

CLASS 4

NAVJYOTI SIR

SSBCrack EXAMS

22 Nov 2024 Live Classes Schedule

8:00AM	22NOVEMBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	22 NOVEMBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	MOCK PERSONAL INTERVIEWS	ANURADHA MA'AM

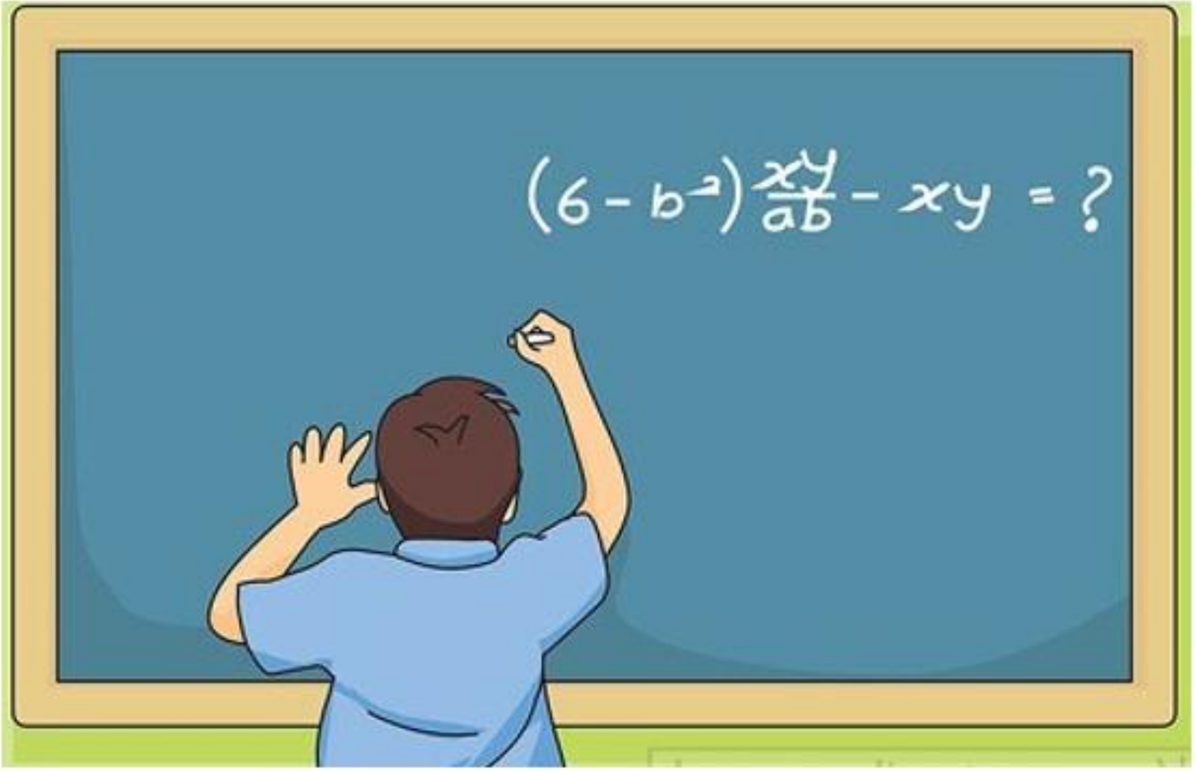
NDA 1 2025 LIVE CLASSES

11:30AM	GK - ECONOMICS - CLASS 5	RUBY MA'AM
1:00PM	PHYSICS - UNITS & DIMENSIONS - CLASS 2	NAVJYOTI SIR
4:30PM	ENGLISH - USAGE OF PAIRED WORDS - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - MATRICES & DETERMINANTS - CLASS 4	NAVJYOTI SIR

CDS 1 2025 LIVE CLASSES

11:30AM	GK - ECONOMICS - CLASS 5	RUBY MA'AM
1:00PM	PHYSICS - UNITS & DIMENSIONS - CLASS 2	NAVJYOTI SIR
4:30PM	ENGLISH - USAGE OF PAIRED WORDS - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - TRIGONOMETRY - CLASS 1	NAVJYOTI SIR

PRACTISE TIME !



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 ✓

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

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 by A^{-1},

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

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

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

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

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(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

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

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

$$k^{-n} \frac{1}{\det A} \det A = k^{-n}$$

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

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

$|A| = ad - bc$

$\text{adj} A = \begin{bmatrix} d & -c \\ -b & a \end{bmatrix}^T = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

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

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

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$$A^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$adj(A^{-1}) = \frac{1}{ad-bc}\begin{bmatrix} a & c \\ b & d \end{bmatrix}$$

$$adj A = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

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

$$= \frac{1}{|A|^{2-1}}\begin{bmatrix} a & c \\ b & d \end{bmatrix}$$

$$= \frac{1}{(ad-bc)^1}\begin{bmatrix} a & c \\ b & d \end{bmatrix}$$

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

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

$$A^3 = A^2 \cdot A$$

$$= \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix} \begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} -4 & 4 \\ 4 & -4 \end{bmatrix} = \underline{4A}$$

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 ✗

$|A| = -1(0-1) = 1 \neq 0$

(A^{-1} exists)

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

$A^2 = A \cdot A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$

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

Each row has 3 consecutive terms,

If a, b, c are in GP

log a, log b and log c are in AP.

$2 \log a_{n+1} = \log a_n + \log a_{n+2}$

$2 \log a_{n+7} = \log a_{n+6} + \log a_{n+8}$

$2 \log a_{n+4} = \log a_{n+5} + \log a_{n+3}$

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

$$C_2 \rightarrow C_1 + C_3 - C_2$$

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

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

$$\begin{bmatrix} \alpha & 1 & 1 \\ 1 & \alpha & 1 \\ 1 & 1 & \alpha \end{bmatrix}$$
(A)

$$|A| = \alpha(\alpha^2-1) - 1(\alpha-1) + 1(1-\alpha) = 0$$
$$= \alpha(\alpha+1)(\alpha-1) + 1 - \alpha + 1 - \alpha = 0$$
$$= (\alpha-1)[\alpha^2+\alpha-2] = 0$$

$$= (\alpha - 1)\left[\alpha^2 + \alpha - 2\right] = 0$$

$$\alpha - 1 = 0$$

$$\alpha = 1$$

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

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

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

$$\alpha = -2, 1$$

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)

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

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

$$0 = AB - BA$$

$$\boxed{AB = BA}$$

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)

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

$$B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I_2$$

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

$$A^2 = A \cdot A$$

$$|A^2| = |A \cdot A| = |A| \cdot |A| = (|A|)^2$$

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

$$|A| = 5(5\alpha - 0) = 25\alpha$$

$$(|A|)^2 = |A^2| = 25$$

$$(25\alpha)^2 = 25 \Rightarrow 625\alpha^2 = 25$$

$$\alpha^2 = \frac{25}{625}$$

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

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

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

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.

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

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

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

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

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(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

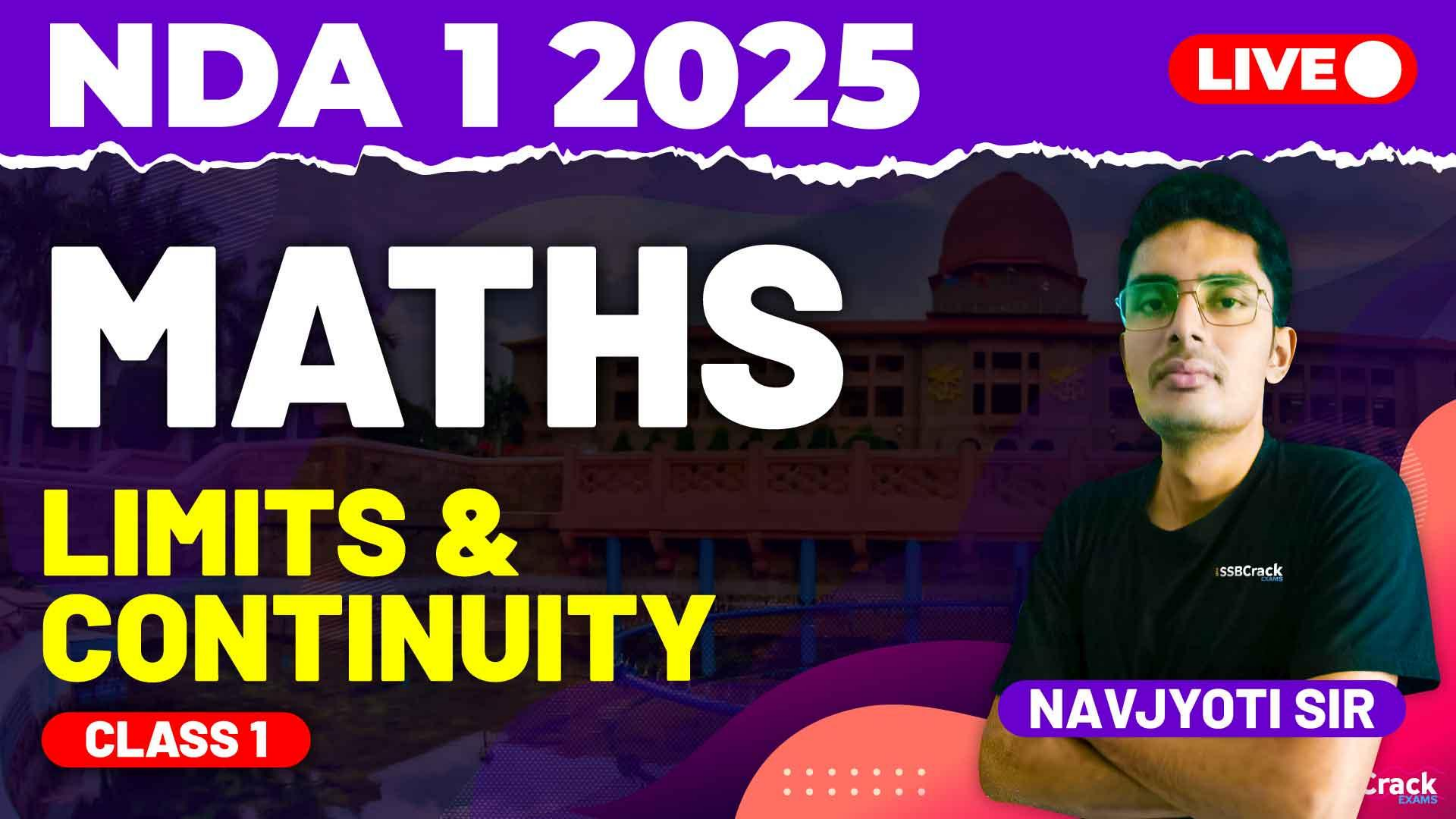
Q) If $a^2 + b^2 + c^2 = -2$ and

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

then f(x) is a polynomial of degree

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

Ans: (d)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