CUET (UG) – MATHEMATICS

Chapter Test - Unit II: Algebra - Determinants

SOLUTIONS

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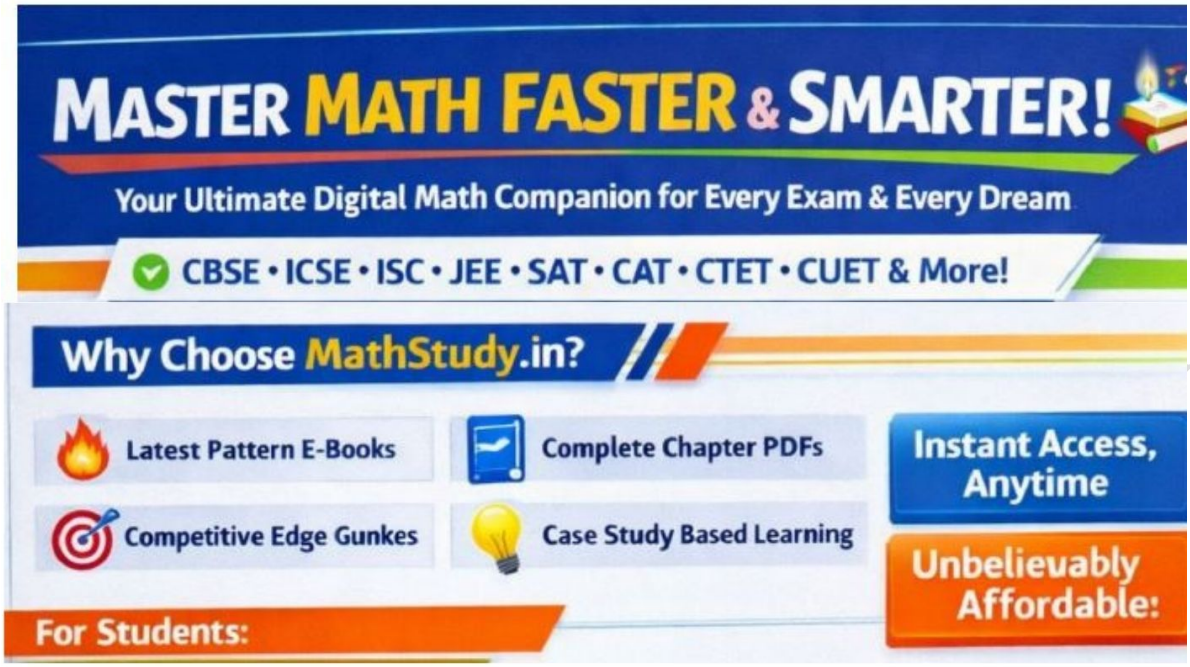

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Solutions

1. **Correct Option: (C)**. $|2A| = 2^3|A| = 8 \times 4 = 32$.
2. **Correct Option: (A)**. For collinearity, $\begin{vmatrix} x & -2 & 1 \\ 5 & 2 & 1 \\ 8 & 8 & 1 \end{vmatrix} = 0$. Expanding gives $x(2-8) - (-2)(5-8) + 1(40-16) = 0 \implies -6x - 6 + 24 = 0 \implies -6x = -18 \implies x = 3$.
3. **Correct Option: (B)**. $|A \cdot adjA| = ||A|I| = |A|^3|I| = |A|^3$.
4. **Correct Option: (A)**. Observe that Row 1 is 6× Row 3 ($17 \times 6 = 102$, $3 \times 6 = 18$, $6 \times 6 = 36$). Since two rows are proportional, the determinant is 0.
5. **Correct Option: (A)**. Singular means $|A| = 0$. $2k - 15 = 0 \implies k = 15/2$.
6. **Correct Option: (A)**. $|adj(adjA)| = |A|^{(n-1)^2}$. For $n = 3$, $|adj(adjA)| = |A|^4 = 2^4 = 16$.
7. **Correct Option: (D)**. $det(A^{-1}) = 1/det(A) = 1/(-3) = -1/3$.
8. **Correct Option: (A)**. For infinite solutions, the lines must be identical. $x + ky = 3$ multiplied by 3 gives $3x + 3ky = 9$. Comparing with $3x + 3y = 9$ gives $3k = 3 \implies k = 1$.
9. **Correct Option: (D)**. By property, $\Delta = \sum a_{ij}A_{ij}$ for any fixed row i or column j. Option (D) represents the expansion along the first row.
10. **Correct Option: (A)**. $|A^{-1} \cdot adjA| = |A^{-1}| \cdot |adjA| = \frac{1}{|A|} \cdot |A|^{n-1} = |A|^{n-2}$. For $n = 3$, $|A|^{3-2} = |A| = 5$.
11. **Correct Option: (B)**. This is the fundamental geometric interpretation of a zero determinant of coordinates in 2D.
12. **Correct Option: (C)**. $|A| = 0(0-1) - 1(0-1) + 1(1-0) = 1 + 1 = 2$.
13. **Correct Option: (A)**. $|adjA| = |A|^{n-1}$. For $n = 2$, $|adjA| = |A|^{2-1} = |A|$.
14. **Correct Option: (C)**. $2x^2 - 40 = 18 - (-14) \implies 2x^2 - 40 = 32 \implies 2x^2 = 72 \implies x^2 = 36 \implies x = \pm 6$.
15. **Correct Option: (A)**. It is a standard property of matrices that inverse and transpose operations are commutative.
16. **Correct Option: (B)**. The determinant of the product of two matrices is the product of their determinants ($|AB| = |A||B|$).
17. **Correct Option: (D)**. All these are standard properties that cause a determinant to vanish.
18. **Correct Option: (C)**. $|A| = 2^3 = 8$. $|adjA| = |A|^{n-1} = 8^{3-1} = 8^2 = 64$.
19. **Correct Option: (C)**. Property: The sum of the products of elements of any row with the cofactors of another row is always 0.
20. **Correct Option: (B)**. Since $A \cdot adjA = |A|I$, $|A \cdot adjA| = ||A|I| = |A|^n|I| = |A|^n$. Thus $k = n$.

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