

CUET Mathematics Test

Section B2: Applied Mathematics - Unit II: Algebra

SOLUTIONS

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Solutions

- Correct Option: (B).** $|adj A| = |A|^{n-1}$. For $n = 3$, $|adj A| = 5^{3-1} = 25$.
- Correct Option: (B).** Non-invertible means $|A| = 0 \implies 8 - (-3\lambda) = 0 \implies 3\lambda = -8 \implies \lambda = -8/3$.
- Correct Option: (C).** The condition $|A| = 0$ and $(adj A)B \neq 0$ defines an inconsistent system with no solution.
- Correct Option: (B).** This is the Reversal Law of Inverses: $(AB)^{-1} = B^{-1}A^{-1}$.
- Correct Option: (A).** Adding C_2 to C_3 makes C_3 a multiple of C_1 (all elements $a+b+c$), hence the determinant is 0.
- Correct Option: (C).** $|3A| = 3^3|A| = 27|A|$. So $k = 27$.
- Correct Option: (A).** Solving $\frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 35$ yields $k = 12$ and $k = -2$.
- Correct Option: (A).** Calculation of A^2 yields $\begin{bmatrix} 7 & 10 \\ 15 & 22 \end{bmatrix}$. Subtracting $5A$ results in $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} = 2I$.
- Correct Option: (C).** $|A^2| = |I| \implies |A|^2 = 1 \implies |A| = \pm 1$.
- Correct Option: (A).** The inverse of a diagonal matrix is a diagonal matrix with reciprocals of the original entries.
- Correct Option: (B).** $A + A^T = \begin{bmatrix} 2 \cos \alpha & 0 \\ 0 & 2 \cos \alpha \end{bmatrix} = I$. $2 \cos \alpha = 1 \implies \alpha = \pi/3$.
- Correct Option: (C).** This is the standard expansion property of determinants.
- Correct Option: (C).** Since A^2 is the zero matrix O , all powers A^n where $n \geq 2$ are also O .
- Correct Option: (A).** To find $adj A$ for 2×2 , swap a and d , and change the signs of b and c .
- Correct Option: (A).** For infinite solutions, the planes must be dependent. $\lambda = 3$ and $\mu = 10$ makes the second and third equations identical.
- Correct Option: (C).** Multiplying A by itself results in the Identity matrix I .
- Correct Option: (A).** Area of triangle formed by collinear points is 0. Solving the determinant/slope equation gives $x = 3$.
- Correct Option: (A).** By the definition of inverse, $A \cdot adj A = |A|I$.
- Correct Option: (B).** $|A| = -19$. $A^{-1} = \frac{1}{-19} \begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix} = \frac{1}{19} \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix} = \frac{1}{19}A$. So $k = 1/19$.
- Correct Option: (C).** $(I + A)^3 - 7A = I + 3A + 3A^2 + A^3 - 7A$. Since $A^2 = A$ and $A^3 = A$, this becomes $I + 7A - 7A = I$.