

CUET Mathematics Test - Set 15

Chapter: Algebra - Determinants (Intermediate)

SOLUTIONS

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Solutions

1. **Solution:** For order n , $|cA| = c^n|A|$. Here $n = 3$, so $|3A| = 3^3|A| = 27|A|$. $k = 27$.
Correct Option: (C)
2. **Solution:** $|3AB| = 3^3|A||B| = 27 \times (-1) \times 3 = -81$. **Correct Option: (B)**
3. **Solution:** For skew-symmetric A , $|A| = |A^T| = |-A| = (-1)^n|A|$. If n is odd, $|A| = -|A| \Rightarrow 2|A| = 0$. **Correct Option: (C)**
4. **Solution:** $|A \cdot adj A| = ||A|I| = |A|^n$. $|A| = 4 - 6 = -2$. For order 2, $(-2)^2 = 4$. **Correct Option: (B)**
5. **Solution:**
$$\begin{vmatrix} a & 0 & 1 \\ 0 & b & 1 \\ 1 & 1 & 1 \end{vmatrix} = 0 \Rightarrow a(b-1) - 0 + 1(0-b) = 0 \Rightarrow ab - a - b = 0 \Rightarrow ab = a + b$$
 Dividing by ab gives $1 = 1/b + 1/a$. **Correct Option: (A)**
6. **Solution:** Sum of products of elements of one row with cofactors of another row is zero.
Correct Option: (B)
7. **Solution:** $A^2 = I \Rightarrow |A|^2 = 1 \Rightarrow |A| = \pm 1$. $|adj A| = |A|^{n-1} = (\pm 1)^2 = 1$. **Correct Option: (A)**
8. **Solution:** Apply $R_2 \rightarrow R_2 - R_1$ and $R_3 \rightarrow R_3 - R_1$:
$$\begin{vmatrix} 1 & 1 & 1 \\ 0 & x & 0 \\ 0 & 0 & y \end{vmatrix} = xy$$
. **Correct Option: (B)**
9. **Solution:** For infinite solutions, $a_1/a_2 = b_1/b_2 = c_1/c_2 \Rightarrow 2/4 = 3/k = 5/10 \Rightarrow 1/2 = 3/k \Rightarrow k = 6$. **Correct Option: (B)**
10. **Solution:** Let $B = 2A$. $|B| = 2^3|A| = 8 \times 4 = 32$. $|adj B| = |B|^{n-1} = 32^2 = 1024$.
Correct Option: (D)
11. **Solution:** Applying transformations as in Question 8, $\Delta = \sin \theta \cos \theta = \frac{1}{2} \sin 2\theta$. Max value is $1/2$. **Correct Option: (B)**
12. **Solution:** $|A| = -4 - 15 = -19$. $adj A = \begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix} = -A$. $A^{-1} = \frac{1}{|A|} adj A = \frac{1}{-19}(-A) = \frac{1}{19}A$. **Correct Option: (A)**
13. **Solution:** $|B| = |kA| = k^n|A| \Rightarrow |B|/|A| = k^n$. **Correct Option: (C)**
14. **Solution:** $2x(x-2) - (-9x) = 3 \Rightarrow 2x^2 - 4x + 9x = 3 \Rightarrow 2x^2 + 5x - 3 = 0$. Roots are $x = 1/2, -3$. **Correct Option: (C)**
15. **Solution:** $|A| = -10 - 30 = -40$. $|adj(adj A)| = |A|^{(n-1)^2}$. For $n = 2$, $(-40)^{(1)^2} = -40$.
Correct Option: (A)