MATRICES

1. For each real number *x* such that $-1 < x < 1$, let $A(x)$ be the matrix $(1-x)^{-1}\begin{bmatrix} 1 & -x \\ -x & 1 \end{bmatrix}$ and $z = \frac{x+y}{1+xy}$. Then

(a) $A(z) = A(x) + A(y)$ (b) $A(z) = A(x)[A(y)]^{-1}$ (c) $A(z) = A(x)A(y)$ (d) $A(z) = A(x) - A(y)$

2. If $A = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$, then the value of A^{40} is

(a) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}$

3. If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$, then

(a) $A^3 + 3A^2 + A - 9I_3 = 0$ (b) $A^3 - 3A^2 + A + 9I_3 = 0$ (c) $A^3 + 3A^2 - A + 9I_3 = 0$ (d) $A^3 - 3A^2 - A + 9I_3 = 0$

4. If $A = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$ and *I* is the unit matrix of order 2, then A^2 equals

(a) $4A - 3I$ (b) $3A - 4I$ (c) $A - I$ (d) $A + I$

5. If $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$, then $(A')^{-1} =$

(a) $\begin{bmatrix} -9 & -8 & -2 \\ 8 & 7 & 2 \\ -5 & -4 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & -2 \\ -2 & -1 & 2 \\ 3 & 4 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} -9 & 8 & -5 \\ -8 & 7 & -4 \\ 2 & 2 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

6. If ω is a cube root of unity and $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \end{bmatrix}$, then $A^{-1} =$

(a) $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega^2 & 1 & \omega \\ \omega & \omega^2 & 1 \end{bmatrix}$ (b) $\frac{1}{3}\begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega^2 & \omega \\ 1 & \omega & \omega^2 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \\ 1 & 1 & 1 \end{bmatrix}$ (d) $\frac{1}{2}\begin{bmatrix} 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \\ 1 & 1 & 1 \end{bmatrix}$

7. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then $A^{-1} =$

(a) *A* (b) A^2 (c) A^3 (d) A^4

8. If $D = \text{diag}(d_1, d_2, d_3, ..., d_n)$, where $d_i \neq 0$ for all $i = 1, 2, ..., n$, then D^{-1} is equal to

(a) *D* (b) $\text{diag}(d_1^{-1}, d_2^{-1}, ...d_n^{-1})$ (c) *I* (d) None of these

9. If $A = \text{diag}(d_1, d_2, d_3, ..., d_n)$, then A^n is equal to

(a) diag $(d_1^{n-1}, d_2^{n-1}, d_3^{n-1}, ...d_n^{n-1})$ (b) diag $(d_1^n, d_2^n, d_3^n, ...d_n^n)$
(c) *A* (d) None of these

10. Which of the following is correct

(a) Determinant is a square matrix (b) Determinant is a number associated to a matrix
(c) Determinant is a number associated to a square matrix (d) None of these

11. Let *A* be a skew-symmetric matrix of odd order, then $|A|$ is equal to

(a) 0 (b) 1 (c) –1 (d) None of these

12. Let *A* be a skew-symmetric matrix of even order, then $|A|$

(a) Is a perfect square (b) Is not a perfect square (c) Is always zero (d) None of these

13. For any 2×2 matrix *A*, if *A*(*adj.A*) $= \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A| =$

(a) 0 (b) 10 (c) 20 (d) 100

14. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$, then determinant of $A^2 - 2A$ is

(a) 5 (b) 25 (c) – 5 (d) – 25

15. If $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix, then *x* is

(a) $\frac{13}{25}$ (b) $-\frac{25}{13}$ (c) $\frac{5}{13}$ (d) $\frac{25}{13}$