MATHS

BOOKS - DHANPAT RAI & CO MATHS (HINGLISH)

MATRICES

Illustration

1. Let A be the set of all 3×3 matrices of whose entries are either 0 or 1. The number of elements is set A, is

A. 2^3

B. 2^6

C. 18

D. 2^9

Answer: D

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2. If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to:

A. A

B. I+A

C. I-A

D. I

Answer: D

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3. The number of elements that a square matrix of order n has below its leading diagonal, is

A. $\frac{n(n+1)}{2}$

B. $\frac{n(n-1)}{2}$

C. $\frac{(n-1)(n-1)}{2}$

D. $\frac{(n+1)(n+1)}{2}$

Answer: B

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4. If $A=\begin{bmatrix}0 & 2\\ 3 & -4\end{bmatrix}$ and $kA=\begin{bmatrix}0 & 3a\\ 2b & 24\end{bmatrix}$, then the values of k,a,b are respectively.

A. $-6, -12, -18$

B. $-6, 4, 9$

C. $-6, -4, -9$

D. $-6, 12, 18$

Answer: C

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5. The value of x for which the metrix product $\begin{bmatrix}2 & 0 & 7\\0 & 1 & 0\\1 & -2 & 1\end{bmatrix}\begin{bmatrix}-x & 14x & 7x\\0 & 1 & 0\\x & -4x & -2x\end{bmatrix}$ equal an identity matrix, is

A. $1/2$

B. $1/3$

C. $1/4$

D. $1/5$

Answer: D

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6. Let M be a 3×3 matrix satisfying

$$M\begin{bmatrix}0\\1\\0\end{bmatrix}=\begin{bmatrix}1\\-1\\6\end{bmatrix}, M\begin{bmatrix}1\\-1\\0\end{bmatrix}=\begin{bmatrix}1\\1\\-1\end{bmatrix} \text{ and } ,M=\begin{bmatrix}1\\1\\1\end{bmatrix}=\begin{bmatrix}0\\0\\12\end{bmatrix}$$

Then the sum of the diagonal entries of M, is

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7. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, then A^2 is equal to

A. a null matrix

B. a unit matrix

C. $-A$

D. A

Answer: B

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8. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $A^2 = I$is true for

A. $\theta = 0$

B. $\theta = \frac{\pi}{4}$

C. $\theta = \frac{\pi}{2}$

D. none of these

Answer: A

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9. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} a & -1 \\ b & -1 \end{bmatrix}$ and $(A+B)^2 = (A^2 + B^2)$ then find the values of a and b.

A. $a = 4, b = 1$

B. $a = 1b = 4$

C. $a = 0, b = 4$

D. $a = 2, b = 4$

Answer: B

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10. The matrix $A = \begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is nilpotent of index

A. 3

B. 2

C. 1

D. None of these

Answer: B

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11. If $A = \begin{bmatrix} -4 & -1 \\ 3 & 1 \end{bmatrix}$, then the determint of the matrix $\left(A^{2016} - 2A^{2015} - A^{2014}\right)$,is

A. 2014

B. 2016

C. -175

D. -25

Answer: B

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12. Let $P = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 16 & 4 & 1 \end{bmatrix}$ and I be the identity matrix of order 3. If $Q = [qij]$ is a matrix, such that $P^{50} - Q = I$, then $\frac{q_{31} + q_{32}}{q_{21}}$ equals

A. 52

B. 103

C. 201

D. 205

Answer: B

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13. Let ω be a complex cube root of unity with $\omega \neq 1 and P = [p_{ij}]$ be a $n \times n$ matrix withe $p_{ij} = \omega^{i+j}$. Then $p^2 \neq O, whe \cap =$ a.57 b. 55 c. 58 d. 56

A. 57

B. 55

C. 58

D. 56

Answer: A

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14. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}, a, b \in N$ Then,

A. there connot exist any B such that AB=BA.

B. there exist more than 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.

Answer: D

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15. Which of the following is (are) NOT the square of a 3×3 matrix with real entries? $[10001000-1]$ (b) $[-1000-1000-1]$ $[100010001]$ (d) $[1000-1000-1]$

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

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

C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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

Answer: A::B

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16. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}, \text{then} A^T + A = I_2$, if

A. $\theta = np, n \in Z$

B. $0 = (2n+1)\frac{\pi}{2}, n \in Z$

C. $\theta = 2n\pi + \frac{\pi}{3}, n \in Z$

D. none of these

Answer: C

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17. Let A be the set of all 3×3 symmetric matrices all of whose entries are either 0 or 1. Five of these entries are 1 and four of them are 0. The number of matrices in A is

A. 12

B. 6

C. 9

D. 3

Answer: A

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18. The square matrix $A = \left[a_{ij} \text{ given by } a_{ij} = (i-j)^3\right.$, is a

A. symmetric matrix

B. skew-symmetric matrix

C. diagonal matrix

D. hermitian matrix

Answer: B

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19. $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix and $AA^T = 9I$, then the ordered pair (a,b) is equal to

A. (2,1)

B. (-2,-1)

C. (2,-1)

D. (-2,1)

Answer: B

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20. If

$P = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}, A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $Q = PAP^T, \quad \text{then} P^T Q^{2015} P$, is

A. $\begin{bmatrix} 2015 & 1 \\ 1 & 2015 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 2015 \\ 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 2015 \\ 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 2015 & 0 \\ 1 & 2015 \end{bmatrix}$

Answer: B

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21. If A is an 3×3 non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then BB^T equals

A. B^{-1}

B. $(B^{-1})^T$

C. $I + B$

D. $\begin{bmatrix} 2015 & 0 \\ 1 & 2015 \end{bmatrix}$

Answer: D

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22. An $n \times n$ matrix is formed using 0,1 and -1 as its elements. The number of such matrices which are skew-symmetric, is

A. $\dfrac{n(n+1)}{2}$

B. $(n-1)^2$

C. $2^{\frac{n(n-1)}{2}}$

D. $3^{\frac{n(n-1)}{2}}$

Answer: D

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23. If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then which one of the following holds for all $n \geq 1$ by the principle of mathematica induction? (A) $A^n = 2^{n-1}A + (n-1)I$ (B) $A^n = nA + (n-1)I$ (C) $A^n = 2^{n-1}A - (n-1)I$ (D) $A^n = nA - (n-1)AI$

A. $A^n = n^{n-1}A + (n-1)I$

B. $A = nA + (n-1)I$

C. $A^n = 2^{n-1}A - (n-1)I$

D. $A = nA - (n-1)I$

Answer: D

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24. For how many values of 'x' in the closed interval $[-4, -1]$ is the matrix $\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$ singular ?

A. 0

B. 2

C. 1

D. 3

Answer: C

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25. If $S = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then adj A is equal to

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

B. $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

C. $\begin{bmatrix} d & b \\ c & a \end{bmatrix}$

D. $\begin{bmatrix} d & c \\ b & a \end{bmatrix}$

Answer: B

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26. if $A = \begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$ then $\left(3A^2 + 12A\right) = ?$

A. $\begin{bmatrix} 72 & -84 \\ -63 & 51 \end{bmatrix}$

B. $\begin{bmatrix} 51 & 63 \\ 84 & 72 \end{bmatrix}$

C. $\begin{bmatrix} 51 & 84 \\ 63 & 72 \end{bmatrix}$

D. $\begin{bmatrix} 72 & -63 \\ -84 & 51 \end{bmatrix}$

Answer: B

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27. If $A = [5a - b32]$ and A adj $A = \forall^T$, then $5a + b$ is equal to: (1) -1 (2) 5 (3) 4 (4) 13

A. -1

B. 5

C. 4

D. 13

Answer: B

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28. If for the matrix A, $A^3 = I$, then $A^{-1} =$ A^2 (b) A^3 (c) A (d) none of these

A. A^2

B. A^3

C. A

D. none of these

Answer: A

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29. If A and B are two square matrices such that AB=I, then which of the following is not true?

A. BA=I

B. $A^{-1} = B$

C. $B^{-1} = A$

D. $A^2 = B$

Answer: D

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30. A square non-singular matrix A satisfies $A^2 - A + 2I = 0, \quad \text{then} \quad A^{-1}$=

A. $I - A$

B. $\frac{1}{2}(I - A)$

C. $I + A$

D. $\frac{1}{2}(I + A)$

Answer: B

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31. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ such that $ad - bc \neq 0$, then A^{-1}, is

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

B. $\frac{1}{ad - bc}\begin{bmatrix} a & -b \\ -c & a \end{bmatrix}$

C. $\begin{bmatrix} d & b \\ -c & a \end{bmatrix}$

D. none of these

Answer: A

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32. Let A be a square matrix all of whose entries are integers. Then which one of the following is true? (1) If $detA = \pm 1, thenA^1$ exists but all its entries are not necessarily integers (2) If $detA \neq \pm 1, thenA^1$ exists and all its entries are non-integers (3) If $detA = \pm 1, thenA^1$ exists and all its entries are integers (4) If $detA = \pm 1, thenA^1$ need not exist

A. If det (A) $= \pm 1$, then A^{-1} exists but all its entries are not necessarily integers.

B. If det $(A) = \pm 1$, then A^1 exists and all its entries are non-integers

C. If det $(A) = \pm 1$, then A^{-1} exsts and all its entries are integers

D. If det \`(A) =pm1," then "need not exist

Answer: C

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33. If $P = \begin{bmatrix} 1 & a & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ is the adjoint of a 3×3 matrix A and $|A| = 4$, then a is equal to

A. 4

B. 11

C. 5

D. 10

Answer: B

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34. If for a matrix A, $|A| = 6$ and $adjA = \begin{bmatrix} 1 & -2 & 4 \\ 4 & 1 & 1 \\ -1 & k & 0 \end{bmatrix}$, then k is equal to

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35. Let A be a 3×3 matrix such that $A^2 - 5A + 7I = 0$ then which of the statements is true

A. statement -1 is false, but statement -2 is true,

B. Both statement are false.

C. Both statement are ture.

D. Statement -1 is true, but statement -2 is false.

Answer: A

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36. The matrix $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ is

A. orthogonal

B. involutory

C. idempotent

D. nilpotent

Answer: A

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37. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then the value of $\left|A^4 - 18A^2 - 32A\right|$ is

A. 1

B. 2

C. 3

D. none of these

Answer: B

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38. The rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 4 & 5 \end{bmatrix}$ is

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39. The rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 1 \end{bmatrix}$, is

A. 1

B. 2

C. 3

D. 4

Answer: B

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40. The rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 6 & 9 \\ 1 & 2 & 3 \end{bmatrix}$, is

A. 1

B. 2

C. 3

D. none of these

Answer: A

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41. The existence of the unique solution of the system $x+y+z=\lambda, 5x-y+\mu z=10, 2x+3y-z=6$ depends on

A. μ only

B. λ only

C. λ and μ both

D. neither λ nor μ

Answer: A

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42. The system of equations $x+y+z=6, x+2y+3z=10, x+2y+\lambda z=k$ is inconsistent if $\lambda = \ldots\ldots\ldots, k \neq \ldots\ldots\ldots$

A. $\lambda = 1$

B. $\lambda = 2$

C. $\lambda = -2$

D. $\lambda = 3$

Answer: D

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43. . For what values of λ and μ the system of equations $x+y+z=6, x+2y+3z=10, x+2y+\lambda z=\mu$ has (i) Unique solution (ii) No solution (iii) Infinite number of solutions

A. $\lambda \neq 3, \mu = 10$

B. $\lambda = 3, \mu \neq 10$

C. $\lambda \neq 3, \mu \neq 10$

D. none of these

Answer: B

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44. The number of values of k, for which the system of equations $(k+1)x + 8y = 4k\ kx + (k+3)y = 3k - 1$ has no solution, is (1) 1 (2) 2 (3) 3 (4) infinite

A. infinte

B. 1

C. 2

D. 3

Answer: B

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45. Let $a, \lambda, \mu \in R,$ Consider the system of linear equations $ax + 2y = \lambda 3x - 2y = \mu$ Which of the flollowing statement (s) is (are) correct?

A. (a) If a = -3, then the system has infinitely many solutions for all value of λ and μ.

B. If $a \neq -3$, then the system has a unique solution fopor all values of λ and μ.

C. If $\lambda + u = 0$, then the system has infinitely many solutions for a = -3`.

D. If $\lambda + \mu \neq 0$, then the system has no solutions for a = -3.

Answer: A

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46. For a real number a, if the system $\begin{bmatrix} 1 & a & a^2 \\ a & 1 & a \\ a^2 & a & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ of the linear equations, has infinitely many solutions, then $1 + a + a^2 =$

A. 1

B. 0

C. -1

D. 2

Answer: A

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47. If $x = cy + bz, y = az + cx, z = x + ay, wherex, y, z$ are not all zeros, then find the value of $a^2b^2c^2 + 2ab \cdot$

A. 2

B. -1

C. 0

D. 1

Answer: D

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48. The system of linear equations $x+\lambda y-z=0$ $\lambda x-y-z=0$ $x+y-\lambda z=0$ has a non-trivial solution for : (1) infinitely many values of λ . (2) exactly one value of λ . (3) exactly two values of λ . (4) exactly three values of λ .

A. infinitely many value of λ

B. exactly one value of λ

C. exactly two values λ

D. exactly three values of λ

Answer: D

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49. The number of possible value of θ lies in $(0, \pi)$, such that system of equation $x + 3y + 7z = 0,$ $-x + 4y + 7z = 0,$ $x \sin 3\theta + y \cos 2\theta + 2z = 0$ has non trivial solution is/are equal to (a) 2 (b) 3 (c) 5 (d) 4

A. one

B. two

C. three

D. none of these

Answer: D

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50. If S is the set of distinct values of $'b$ for which the following system of linear equations $x + y + z = 1$ $x + ay + z = 1$ $ax + by + z = 0$ has no solution, then S is : a finite set containing two or more elements (2) a singleton an empty set (4) an infinite set

A. an empty set

B. an infinite set

C. a finite set containing two or more elements

D. a singleton set

Answer: D

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Section I Solved Mcqs

1. If A and B are two matrices such that $AB = A$ and $BA = B$, then B^2 is equal to B (b) A (c) 1 (d) 0

A. BA=I

B. A

C. 1

D. 0

Answer: A

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2. If the square matrices A and B are such that $AB = A$ and $BA = B$, then

A. $B^2 = B$ and $A^2 = A$

B. $B^2 \neq B$ and $A^2 = A$

C. $A^2 \neq A, B^2 = B$

D. $A^2 \neq A, B^2 \neq B$

Answer: A

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3. If A and B are two matrices such that AB=B and BA=A , then $A^2 + B^2 =$

A. 2 AB

B. 2 BA

C. A + B

D. AB

Answer: C

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4. If $A = [a_{ij}]$ is a square matrix of even order such that $a_{ij} = i^2 - j^2$, then

A. A is a skew-symmetric matrix and $|A| = 0$

B. A is symmetric matrix and $|A|$ is a square

C. A is symmetric matrix and $|A| = 0$

D. none of these

Answer: D

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5. If $\begin{bmatrix} \cos\frac{2\pi}{7} & -\sin\frac{2\pi}{7} \\ \sin\frac{2\pi}{7} & \cos\frac{2\pi}{7} \end{bmatrix}^k = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the least positive integral value of k, is

A. 3

B. 4

C. 6

D. 7

Answer: D

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6. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}, n \in N \text{ then } A^{4n}$equal

A. $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

Answer: C

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7. If A is a singular matrix, then adj A is a. singular b. non singular c. symmetric d. not defined

A. non-sigular

B. singular

C. symmetric

D. not defined

Answer: B

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8. If A, B are two $n \times n$ non-singular matrices, then (1) AB is non-singular (2) AB is singular (3) $(AB)^{-1} = A^{-1}B^{-1}$ (4) $(AB)^{-1}$ does not exist

A. AB is non-singylar

B. AB is singular

C. $(AB)^{-1} = A^{-1}B^{-1}$

D. $(AB)^{-1}$ does not exist

Answer: A

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9. Let A be an inbertible matrix. Which of the following is not true?

A. $\left(A^T\right)^{-1} = \left(A^{-1}\right)^T$

B. $A^{-1} = |A|^{-1}$

C. $\left(A^2\right)^{-1} = \left(A^{-1}\right)^2$

D. $\left|A^{-1}\right| = |A|^{-1}$

Answer: B

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10. If the matrix AB s zero, then

A. It is not necessary that either A=O or B=O

B. A=O or B=O

C. A=O and B=O

D. all the above statements are wrong

Answer: A

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11. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then the value of $|adjA|$, is

A. a^{27}

B. a^{9}

C. a^{6}

D. a^{2}

Answer: C

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12. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then det (adj(adj A) is

A. 14^4

B. 14^3

C. 14^2

D. 14

Answer: A

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13. If B is a non-singular matrix and A is a square matrix, then $\det(B^{-1}AB)$ is equal to (A) $\det(A^{-1})$ (B) $\det(B^{-1})$ (C) $\det(A)$ (D) $\det(B)$

A. $\det(A^{-1})$

B. $\det(B^{-1})$

C. $\det(A)$

D. $\det(B)$

Answer: C

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14. For any 2×2 matrix, if $A\ (adj\ A) = [100010]$, then $|A|$ is equal to (a) 20 (b) 100 (c) 10 (d) 0

A. 20

B. 100

C. 10

D. 0

Answer: C

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15. If A, B are square matrices of order 3,A is non0singular and AB = O, then B is a

A. null matrix

B. singular matrix

C. unit matrix

D. non-singular matrix.

Answer: A

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16. If $A = \begin{bmatrix} n & 0 & 0 \\ 0 & n & 0 \\ 0 & 0 & n \end{bmatrix}$ and $B = \begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$, then AB is equal to

A. BA=I

B. nB

C. B^n

D. A + B

Answer: B

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17. If $A=[1a01]$, then A^n (where $n \in N$) equals $[1na01]$ (b) $\left[1n^2a01\right]$ (c) $[1na00]$ (d) $[\cap a0n]$

A. $A=\begin{bmatrix}1 & na\\ 0 & 1\end{bmatrix}$

B. $A=\begin{bmatrix}1 & n^2a\\ 0 & 1\end{bmatrix}$

C. $A=\begin{bmatrix}1 & na\\ 0 & 0\end{bmatrix}$

D. $A=\begin{bmatrix}1 & 2a\\ 0 & n\end{bmatrix}$

Answer: B

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18. If $A^5=O$ such that $A^n \ne I$ for $1 \le n \le 4$, then $(I-A)^{-1}$ is equal to

A. A^4

B. A^3

C. $I + A$

D. none of these

Answer: D

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19. If A satisfies the equation $x^3 - 5x^2 + 4x + \lambda = 0$, then A^{-1} exists if $\lambda \neq 1$ (b) $\lambda \neq 2$ (c) $\lambda \neq -1$ (d) $\lambda \neq 0$

A. $\lambda \neq 1$

B. $\lambda \neq 3$

C. $\lambda \neq -1$

D. $\lambda \neq 0$

Answer: D

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20. The system of equations: $x+y+z=5 \quad x+2y+3z=9$ $x+3y+\lambda z=\mu$ has a unique solution, if $\lambda=5, \mu=13$ (b) $\lambda \neq 5$ $\lambda=5, \mu \neq 13$ (d) $\mu \neq 13$

A. $\lambda=5, \mu=13$

B. $\lambda \neq 5$

C. $\lambda=5, \mu \neq 13$

D. $\mu \neq 13$

Answer: B

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21. The matrix $\bar{A}=\begin{bmatrix}-i & 1+2i \\ -1+2i & 0\end{bmatrix}$ is which of the following?

A. symmetric matrix

B. skew-symmetric

C. hermitian

D. skew-hermitian

Answer: D

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22. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then the value of α for which $A^2 = B$, is

A. 1

B. -1

C. 4

D. no real values

Answer: D

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23. If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A+B)^2$ is equal to

A. O

B. $A^2 + B^2$

C. $A^2 + 2AB + B^2$

D. $A + B$

Answer: B

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24. The element in the first row and third column of the inverse of the matrix $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$, is

A. -2

B. 0

C. 1

D. none of these

Answer: C

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25. A square matrix can always be expressed as

A. the sum of a symmetric and a skew-symmetric matrix.

B. the sum of a diagonal matrix and a symmetric matrix

C. a skew-symmetric matrix

D. a skew-matrix

Answer: A

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26. If $\begin{bmatrix} a & b^3 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 8 \\ 2 & 0 \end{bmatrix}$, then $\begin{bmatrix} a & b \\ 2 & 0 \end{bmatrix}^{1}_{-1} =$

A. $\begin{bmatrix} 0 & -2 \\ -2 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -8 \\ -2 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1/2 \\ 1/2 & -1/4 \end{bmatrix}$

Answer: D

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27. If A is a square matrix such that $A^2 - A + l = 0$, then the inverse of A is

A. I-A

B. A-I

C. A

D. A+I

Answer: A

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28. If A is a 3x3 matrix and B is its adjoint matrix the determinant of B is 64 then determinant of A is

A. 64

B. $p \pm 64$

C. ± 8

D. 18

Answer: C

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29. If $A=\frac{1}{3}\begin{bmatrix}1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b\end{bmatrix}$ is an orthogonal matrix, then

A. $a=2, b=1$

B. $a=-2, b=-1$

C. $a=2, b=-1$

D. $a=-2, b=1$

Answer: B

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30. If $A=\begin{bmatrix}\omega & 0 \\ 0 & \omega\end{bmatrix}$, where ω is cube root of unity, then what is A^{100} equal to ?

A. A

B. $-A$

C. O

D. none of these

Answer: A

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31. If $A^3 = O$, then prove that $(I - A)^{-1} = I + A + A^2$.

A. $I - A$

B. $(I - A)^{-1}$

C. $(I + A)^{-1}$

D. none of these

Answer: B

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32. If $A = \begin{bmatrix} 0 & 1 & -1 \\ 2 & 1 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ then $\left(A(adjA)A^{-1}\right)A =$

A. $2\begin{bmatrix}3 & 0 & 0\\0 & 3 & 0\\0 & 0 & 3\end{bmatrix}$

B. $\begin{bmatrix}-6 & 0 & 0\\0 & -6 & 0\\0 & 0 & -6\end{bmatrix}$

C. $\begin{bmatrix}0 & 1/6 & -1/6\\2/6 & 1/6 & 3/6\\3/6 & 2/6 & 1/6\end{bmatrix}$

D. none of these

Answer: A

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33. If A is non-singular and $(A-2I)(A-4I)=O, then\frac{1}{6}A+\frac{4}{3}A^{-1}$ is equal to OI b. $2I$ c. $6I$ d. I

A. I

B. O

C. 2I

D. 6I

Answer: A

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34. If A is an invertible matrix of order 3×3 such that $|A| = 2$. Then, find $adj\ (adj\ A)$.

A. $|\forall|$

B. $|A|^2 A$

C. $|A|^{-1} A$

D. none of these

Answer: A

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35. A and B are square matrices of order 3×3 , A is an orthogonal matrix and B is a skew symmetric matrix. Which of the following statement is not true

A. $|AB| = 1$

B. $|AB| = 0$

C. $|AB| = -1$

D. none of these

Answer: B

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36. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and determinant $(A^3) = 125$, then the value of α is

(a) ± 1 (b) ± 2 (c) ± 3 (d) ± 5

A. ± 1

B. ± 2

C. ± 3

D. ± 5

Answer: C

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37. If

$P = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}, A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $Q = PAP^T, \quad \text{then} P^T Q^{2015} P$, is

A. $\begin{bmatrix} 1 & 2005 \\ 0 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 2005 \\ 2005 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 2005 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Answer: A

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38. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}, 6A^{-1} = A^2 + cA + dI,$ then $(c, d) =$

A. (-6,11)

B. (-11,6)

C. (11,6)

D. (6,11)

Answer: A

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39. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ and U_1, U_2, U_3 be column matrices satisfying $AU_1 \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, AU_2 \begin{bmatrix} 2 \\ 3 \\ 6 \end{bmatrix}, AU_3 \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$.If U is 3×3 matrix whose columns are $U_1, U_2, U_3, \quad \text{then} \quad |U| =$

A. 3

B. -3

C. $3/2$

D. 2

Answer: A

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40. In Example 50, the sum of the elements of U^{-1} is

A. -1

B. 0

C. 1

D. 3

Answer: B

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41. If U is same as in Example 50, then the value of $\begin{bmatrix} 3 & 2 & 0 \end{bmatrix} U \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix} =$

A. 5

B. $5/2$

C. 4

D. $3/2$

Answer: A

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42. 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 A or B is a zero matrix

D. either A or B is an identity matrix

Answer: B

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43. If A and B are any two different square matrices of order n with $A^3 = B^3$ and $A(AB) = B(BA)$ then

A. $A^2 + B^2 = O$

B. $A^2 + B^2 = I$

C. $A^3 + B^3 = I$

D. none of these

Answer: D

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44. Let $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$. The only correct statement aboul the matrix A is

A. A^{-1} does not exist

B. $A = (-1)I$ is a unit matrix

C. A is a zero matrix

D. $A^2 = I$

Answer: D

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45. Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$. If B is the inverse of A, then α is :

A. 2

B. -1

C. 3

D. 5

Answer: D

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46. Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix} .If A^2 = 25,$ then α equals to:

A. $\frac{1}{5}$

B. 5

C. 5^2

D. 1

Answer: A

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47. If $A = \alpha \begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix} a \in R$, is a unitary matrix then α^2 is

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{2}{9}$

Answer: B

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48. If $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ is orthogonal matrix, then the value of $|abc|$ is equal to (where $|\cdot|$ represents modulus function)

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{6}$

D. 1

Answer: C

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49. If $A=\left[a_{ij}\right]_{n\times n}$, where $a_{ij}=i^{100}+j^{100}$, then $\lim_{n\to\infty}\left(\frac{\sum_{i=1}^{n} a_{ij}}{n^{101}}\right)$ equals

A. $\frac{1}{50}$

B. $\frac{1}{101}$

C. $\frac{2}{101}$

D. $\frac{3}{101}$

Answer: C

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50. If A and B are two non-singular matrices which commute, then $\left(A(A+B)^{-1}B\right)^{-1}(AB) =$

A. A + B

B. $A^{-1} + B$

C. $A^{-1} + B^{-1}$

D. none of these

Answer: C

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51. Find the inverse of $[01 - 14 - 343 - 34]$

A. 2A

B. $\frac{1}{2}A^{-1}$

C. $\frac{1}{2}A$

D. A^2

Answer: A

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52. In a 4×4 matrix the sum of each row, column and both the main diagonals is α. Then the sum of the four corner elements

A. is also α

B. may not be α

C. is never equal to α

D. none of these

Answer: A

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53. If $A = [a_{ij}]_{4 \times 4}$ such that $a_{ij} = \left\{ \begin{matrix} 2; & \text{if } i = j \\ 0; & \text{if } i \neq j \end{matrix} \right)$ then $\left\{ \dfrac{\det(adj(adjA))}{7} \right\}$ is (where {.} represent fractional portion) (A) $\frac{1}{7}$ (B) $\frac{2}{7}$

(C) $\frac{3}{7}$ (D) none of these

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{3}{7}$

D. none of these

Answer: A

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54. If A is skew-symmetric matrix of order 2 and $B=\begin{bmatrix}1 & 4\\ 2 & 9\end{bmatrix}$ and $c\begin{bmatrix}9 & -4\\ -2 & 1\end{bmatrix}$ respectively. Then $A^3BC+A^5B^2C^2+A^7B^3C^3+\ldots.+A^{2n+1}B^nC^n$ where $n\in N$ is

A. a symmetric matrix

B. a skew-symmetric matrix

C. an identity matrix

D. none of these

Answer: B

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55. Let $p = \begin{bmatrix} 3 & -1 & -2 \\ 2 & 0 & \alpha \\ 3 & -5 & 0 \end{bmatrix}$, where $\alpha \in \mathbb{R}$. Suppose $Q = [q_{ij}]$ is a matrix such that $PQ = kl$, where $k \in \mathbb{R}, k \neq 0$ and l is the identity matrix of order 3. If $q_{23} = -\frac{k}{8}$ and $\det(Q) = \frac{k^2}{2}$, then

A. $\alpha 0, k = 8$

B. $4\alpha - k + 8 = 0$

C. $\det(PadjQ) = 2^9$

D. $\det(QadjP)2^{13}$

Answer: B::C

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56. let

$z = \frac{-1 + \sqrt{3i}}{2}, where i = \sqrt{-1}$ and $r, s \varepsilon P1, 2, 3 \big\}. Let P = \Big[\begin{matrix} (-z)^r & z \\ z^{2s} & z \end{matrix}$

and I be the idenfity matrix or order 2. Then the total number of ordered pairs (r,s) or which $P^2 = -I$ is

A. 1

B. 2

C. 3

D. 5

Answer: A

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57. How many 3×3 matrices M with entries from $\{0, 1, 2\}$ are there, for which the sum of the diagonal entries of $M^T M is 5?$ 126 (b) 198 (c) 162 (d) 135

A. 126

B. 198

C. 162

D. 135

Answer: B

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Section I Assertion Reason Type

1. If A; B are non singular square matrices of same order; then $adj(AB) = (adjB)(adjA)$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: A

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2. Let A be a square matrix of order n.

Statement - 1 : $|adj(adjA)| = |A|^{n-1} \hat{} 2$

Statement -2 : $adj(adjA) = |A|^{n-2}A$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: A

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3. Statement -1 : if $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then adj(adj A)=A

Statement -2 If A is a square matrix of order n, then $adj(adjA) = |A|^{n-2}A$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: A

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4. If nth-order square matrix A is a orthogonal, then $|\text{adj } (\text{adj } \text{A})|$ is

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: C

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5. Let A be a non-singular square matrix of order n. Then; $|adjA| = |A|^{n-1}$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: C

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6. Let $A = [a_{ij}]$ be a square matrix of order n such that

$$a_{ij} = \begin{cases} 0 & \text{if} \quad i \neq j \\ i & \text{if} \quad i = j \end{cases}$$

Statement -2 : The inverse of A is the matrix $B = [b_{ij}]$ such that

$$b_{ij} = \begin{cases} 0 & \text{if} \quad i \neq j \\ \frac{1}{i} & \text{if} \quad i = j \end{cases}$$

Statement -2 : The inverse of a diagonal matrix is a scalar matrix.

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: C

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7. Let A be 2 x 2 matrix.Statement I $adj(adjA) = A$ Statement II $|adjA| = A$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: B

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8. Let A be a 2×2 matrix with real entries. Let I be the 2×2 identity matrix. Denote by tr (A), the sum of diagonal entries of A. Assume that $A^2 = I$. Statement 1: If $A \neq I$ and $A \neq -I$, then det $A = -1$. Statement 2: If $A \neq I$ and $A \neq -I$, then $tr(A) \neq 0$. (1) Statement 1 is false, Statement $(2)(3) - 2(4)$ is true (6) Statement 1 is true, Statement $(7)(8) - 2(9)$ (10) is true, Statement $(11)(12) - 2(13)$ is a correct explanation for Statement 1 (15) Statement 1 is true, Statement $(16)(17) - 2(18)$ (19) is true; Statement $(20)(21) - 2(22)$ is not a correct explanation for Statement 1. (24) Statement 1 is true, Statement $(25)(26) - 2(27)$ is false.

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: C

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9. Let A be an orthogonal square matrix.

Statement -1 : A^{-1} is an orthogonal matrix.

Statement -2 : $(A^{-1})^T = (A^T)^{-1}$ and $(AB)^{-1} = B^{-1}A^{-1}$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: A

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10. Let AX = B be a system of n smultaneous linear equations with n unknowns.

Statement -1 : If $|A| = 0$ and $(adjA)B \neq 0$, the system is consistent with infinitely many solutions.

Statement -2 : A $(adjA) = |A|I$

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: D

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11. Let A be a 2×2 matrix with non-zero entries and let A^2=I, where i is a 2×2 identity matrix, Tr(A) i= sum of diagonal elements of A and $|A|$ = determinant of matrix A. Statement 1:Tr(A)=0 Statement 2: $|A|$=1

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: C

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12. 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. Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1. Statement-1 is true, Statement-2 is true; Statement-2 is true; Statement-2 is not a correct explanation for Statement-1. Statement-1 is true, Statement-2 is false. Statement-1 is false, Statement-2 is true.

A. Statement -1 is True, Statement -2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement -2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement -1 is True, Statement -2 is False.

D. Statement -1 is False, Statement -2 is True.

Answer: B

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Exercise

1. A matrix $A = [a_{ij}]$ is an upper triangular matrix, if

A. it is a square matrix and $a_{ij} = 0, i < j$

B. it is a square matrix and $a_{ij} = 0, i > j$

C. it is not a square matrix and $a_{ij} = 0, i > j$

D. it is not a square matrix and $a_{ij} = 0, i < j$

Answer: B

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2. If A is any $m \times n$ matrix such that AB and BA are both defined, then B is a matrix of order

A. $m \times n$

B. $n \times m$

C. $n \times n$

D. $m \times m$

Answer: B

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3. If $E(\theta) = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then $E(\alpha)E(\beta) =$

A. $E(0^\circ)$

B. $E(\alpha\beta)$

C. $E(\alpha + \beta)$

D. $E(\alpha - \beta)$

Answer: C

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4. If $E(\theta) = \begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix}$, and θ and ϕ differ by an odd multiple of $\pi/2$, then $E(\theta)E(\phi)$ is a

A. null matrix

B. unit matrix

C. diagonal matrix

D. none of these

Answer: A

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5. $A = \begin{bmatrix} \cos^2 \alpha & \cos \alpha \sin \alpha \\ \cos \alpha \sin \alpha & \sin^2 \alpha \end{bmatrix}$
$B = \begin{bmatrix} \cos^2 \beta & \cos \beta \sin \beta \\ \cos \beta \sin \beta & \sin^2 \beta \end{bmatrix}$
are two matrices such that the product AB is the null matrix, then $(\alpha - \beta)$ is

A. 0

B. multiple of π

C. an odd multiple of $\pi / 2$

D. none of these

Answer: C

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6. If the matrix A is such that $\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix} A = \begin{pmatrix} 1 & 1 \\ 0 & -1 \end{pmatrix}$, then what is A equal to ?

A. $\begin{bmatrix} 1 & 4 \\ -1 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & -4 \\ 0 & -1 \end{bmatrix}$

D. none of these

Answer: C

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7. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, J = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then B= (A) $I\cos\theta + J\sin\theta$ (B) $I\cos\theta - J\sin\theta$ (C) $I\sin\theta + J\cos\theta$ (D) $-I\cos\theta + J\sin\theta$

A. $I\cos\theta + j\sin\theta$

B. $I\sin\theta + j\cos\theta$

C. I cos theta-jsintheta`

D. $-I\cos\theta + j\sin\theta$

Answer: A

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8. If A is a square matrix such that $AA^T = I = A^T A$, then A is

A. a symmetric matrix

B. a skew-symmetric matrix

C. a diagonal matrix

D. an orthogonal matrix.

Answer: D

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9. If A is an orthogonal matrix then A^{-1} equals A^T b. A c. A^2 d. none of these

A. A

B. A^T

C. A^2

D. none of these

Answer: B

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10. If $D = diag(d_1, d_2, d_3, \ldots, d_n)$ where $d \neq 0$ for all $I = 1, 2, \ldots, n,$ then is equal to

A. D

B. $diag\left(d_1^{-1} d_2^{-1}, \ldots, d_n^{-1}\right)$

C. In

D. none of these

Answer: B

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11. If $A = \begin{bmatrix} b & b^2 \\ -a^2 & -ab \end{bmatrix}$, then A is

A. Idempotent

B. involutory

C. nilpotent

D. scalar

Answer: C

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12. If A is a 3×3 matrix and B is a matrix such that $A^T B$ and BA^T are both defined, then order of B is

A. 3×4

B. 3×3

C. 4×4

D. 4×3

Answer: A

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13. Let $A = \begin{bmatrix} 1 & 2 \\ -5 & 1 \end{bmatrix}$ and $A^{-1} = xA + yI$, then the values of x and y are

A. $x = -\frac{1}{11}, y = \frac{2}{11}$

B. $x = -\frac{1}{11}, y = -\frac{2}{11}$

C. $x = \frac{1}{11}, y = \frac{2}{11}$

D. $x = \frac{1}{11}, y = -\frac{2}{11}$

Answer: A

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14. If the square matrices A and B are such that $AB = A$ and $BA = B$, then

A. A, B are idempotent

B. only A is idempotent

C. only B is idempotent

D. none of these

Answer: A

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15. The inverse of an invertible symmetric matrix is a symmetric matrix.

A. symmetric

B. skew-symmetric

C. diagonal matrix

D. none of these

Answer: A

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16. The inverse of a diagonal matrix is a. a diagonal matrix b. a skew symmetric matrix c. a symmetric matrix d. none of these

A. a symmetric matrix

B. a skew-symmetric matrix

C. a diagonal matrix

D. none of these

Answer: C

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17. If A is a symmetric matrix and $n \in N$ then A^n is

A. symmetric

B. skew-symmetric

C. a diagonal matrix

D. none of these

Answer: A

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18. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is a skew-symmetric matrix a symmetric matrix a diagonal matrix none of these

A. a symmetric matrix

B. skew-symmetric matrix

C. diagonal matrix

D. none of these

Answer: D

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19. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is a skew-symmetric matrix a symmetric matrix a diagonal matrix none of these

A. a symmetric matrix

B. a skew-symmetric matrix

C. a diagonal matrix

D. none of these

Answer: B

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20. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is a skew-symmetric matrix a symmetric matrix a diagonal matrix none of these

A. a symmetric matrix

B. a skew-symmetric matrix

C. a diagonal matrix

D. none of these

Answer: A

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21. If $A = [a_{ij}]$ is a skew-symmetric matrix of order n, then $a_{ij} =$

A. 0 for some i

B. 0 for all I = 1,2,...,n

C. 1 for some i

D. 1 for all I = 1,2,...,n

Answer: B

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22. If A and B are symmetric matrices of the same order, write whether $AB - BA$ is symmetric or skew-symmetric or neither of the two.

A. symmetric matrix

B. skew-symmetric matrix

C. null matrix

D. unit matrix

Answer: B

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23. If A and B are square matrices of the same order such that $AB = BA$, then show that $(A+B)^2 = A^2 + 2AB + B^2$.

A. $AB = I$

B. $BA = I$

C. $AB = BA$

D. none of these

Answer: C

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24. The trace of the matrix $A = [1 - 570791189]$ is (a) 17 (b) 25 (c) 3 (d) 12

A. 17

B. 25

C. 3

D. 12

Answer: A

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25. If A is a skew- symmetric matrix, then trace of A is: 1.) 1 2.) -1 3.) 0 4.)none of these

A. 1

B. -1

C. 0

D. none of these

Answer: C

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26. If $A = \begin{bmatrix} 1 & x \\ x^7 & 4y \end{bmatrix} a$, $B = \begin{bmatrix} -3 & 1 \\ 1 & 0 \end{bmatrix}$ and $adjA + B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the values of x and y are respectively

A. (1,1)

B. (-1,1)

C. (1,0)

D. none of these

Answer: A

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27. If A is a square matrix of order $n \times n$ and k is a scalar, then $adj(kA)$ is equal to (1) $kadjA$ (2) $k^n adjA$ (3) $k^{n-1} adjA$ (4) $k^{n+1} adjA$

A. k adj A

B. $k^n adjA$

C. $k^{n-1} adjA$

D. $k^{n+1} adj A$

Answer: C

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28. If A is a singular matrix, then adj A is a. singular b. non singular c. symmetric d. not defined

A. singular

B. non-singular

C. symmetric

D. not defined

Answer: A

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29. If A is a non singular square matrix; then $adj(adjA) = |A|^{n-2}A$

A. $|A|^{n}A$

B. $|A|^{n-1}A$

C. $|A|^{n-2}A$

D. $|A|^{n-3}A$

Answer: C

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30. If A is a singular matrix, then adj A is a. singular b. non singular c. symmetric d. not defined

A. identity matrix

B. null matrix

C. scalar matrix

D. none of these

Answer: B

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31. If $A=\begin{bmatrix}\cos x & \sin x\\ -\sin x & \cos x\end{bmatrix}$ and $A.(adjA)=k\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ then the value of k is

A. $\sin x\cos x$

B. 1

C. 2

D. 3

Answer: B

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32. If $A=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$,prove that $A^n=\begin{bmatrix}2^{n-1} & 2^{n-1}\\ 2^{n-1} & 2^{n-1}\end{bmatrix}$, for all positive integers n.

A. $2^n A$

B. $2^{n-1} A$

C. nA

D. none of these

Answer: B

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33. If $A = [(a, b), (b, a0]$ and $A^2 = [(\alpha, \beta 0, (\beta, \alpha)]$ then (A) $\alpha = a^2 + b^2, \beta = ab$ (B) $\alpha = a^2 + b^2, \beta = 2ab$ (C) $\alpha = a^2 + b^2, \beta = a^2 - b^2$ (D) $\alpha = 2ab, \beta = a^2 + b^2$

A. $\alpha = a^2 + b^2, \beta = ab$

B. $\alpha = a^2 + b^2, \beta = 2ab$

C. $\alpha = a^2 + b^2, \beta = a^2 - b^2$

D. $\alpha = 2ab, \beta = a^2 + b^2$

Answer: B

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34. If A is an invertible square matrix; then $adjA^T = (adjA)^T$

A. $2|A|$

B. $2|A|I$

C. null matrix

D. unit matrix

Answer: C

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35. If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $A^2 - kA - 5I_2 = 0$ then $k =$

A. 3

B. 5

C. 7

D. -7

Answer: B

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36. If $A = [a_{ij}]$ is a scalar matrix, then trace of A is

A. $\sum_i \sum_j a_{ij}$

B. $\sum_i a_{ij}$

C. $\sum_j a_{ij}$

D. $\sum_i a_{ij}$

Answer: D

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37. If $A = [a_{ij}]$ is a scalar matrix of order $n \times n$ such that $a_{ii} = k$ for all i, then trace of A is equal to nk (b) $n + k$ (c) $\frac{n}{k}$ (d) none of these

A. nk

B. n+k

C. n/k

D. none of these

Answer: A

Watch Video Solution

38. If $A = [a_{ij}]$ is a scalar matrix of order $n \times n$ such that $a_{ij} = k$ for all I, then $|A| =$

A. nk

B. n+k

C. nk

D. kn

Answer: D

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39. If $A = [a_{ij}]$ is a scalar matrix of order $n \times n$ and k is a scalar, then $|kA| =$

A. $k^n|A|$

B. $k|A|$

C. $k^{n-1}|A|$

D.

Answer: A

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40. Let $F(\alpha) = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ where $a \in R$. Then, $(F(\alpha))^{-1}$ is equal to

A. $F(-\alpha)$

B. $F(\alpha^{-1})$

C. $F(2\alpha)$

D. none of these

Answer: A

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41. $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $G(x) = \begin{bmatrix} \cos x & 0 & \sin x \\ 0 & 1 & 0 \\ -\sin x & 0 & \cos x \end{bmatrix}$, then $[F(x)G(y)]^{-1}$ is equal to (A) $F(-x)G(-y)$ (B) $F(x-1)G(y-1)$ (C) $G(-y)F(-x)$ (D) $G(y^{-1})F(x^{-1})$

A. $F(-x)G(-y)$

B. $F\left(x^{-1}\right)_G\left(y^{-1}\right)$

C. $G(-y)F(-x)$

D. $G\left(y^{-1}\right)F\left(x^{-1}\right)$

Answer: C

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42. if $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then $A = ?$

A. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -i & 0 \\ 0 & -i \end{bmatrix}$

C. $\begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$

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

Answer: A

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43. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then

A. $a = 1, b = 1$

B. $a = \cos 2\theta, b = \sin 2\theta$

C. $a = \sin 2\theta, b = \cos 2\theta$

D. none of these

Answer: B

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44. If A and B are matrices such that AB and A + B both are defined, then

A. A and B can be any two matrices

B. A and B are square matrices not necessarily of the same order

C. A, B are square matries of the same order

D. number of columns of A is same as the number of rows of B

Answer: C

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45. If a matrix A is such that $3A^3 + 2A^2 + 5A + I = 0$, then A^{-1} is equal to

A. $-(3A^2 + 2A + 5)$

B. $3A^2 + 2A + 5$

C. $3A^2 - 2A - 5$

D. none of these

Answer: A

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46. Let A and B be matrices of order 3×3. If $AB = 0$, then which of the following can be concluded?

A. $A = O \text{ and } B = O$

B. $|A| = O \text{ and } |B| = O$

C. either absA=Oor absB=O`

D. $A = O \text{ or } B = O$

Answer: C

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47. Which of the following is incorrect ?

A. $A^2 - B^2 = (A + B)(A - B)$

B. $\left(A^T\right)^T = A$

C. $(AB)^n = A^n B^n \text{ where A, B commute}$

D. $\left(A^{-1}\right)^T \neq \left(A^T\right)^{-1}$

Answer: A

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48. If A is an invertible matrix, then which of the following is correct

A. A^{-1} is multivalued

B. A^{-1} is singular

C. $(A^{-1})^T \neq (A^T)^{-1}$

D. $|A| \neq 0$

Answer: D

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49. Which of the following is/are incorrect?

(i) adjoint of a symmetric matrix is symmetric

(ii) adjoint of a unit matrix is a unit matrix

(iii) $A(adjA) = (adjA)A = |A|I$

(iv) adjoint of a diagonal matrix is a diagonal matrix

A. (i)

B. (ii)

C. (iii) and (iv)

D. none of these

Answer: D

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50. If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be the square root of two-rowed unit matrix, then α, β and γ should satisfy the relation

A. $1 + \alpha^2 + \beta\gamma = 0$

B. $1 - \alpha^2 - \beta\gamma = 0$

C. $1 - \alpha^2 + \beta\gamma = 0$

D. $\alpha^2 - \beta\gamma - 1 = 0$

Answer: D

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51. If for a matrix $A, A^2+I=O$ where I is the indentity matrix, then $A=$

A. $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

B. $\begin{bmatrix}-i & 0\\ 0 & -i\end{bmatrix}$

C. $\begin{bmatrix}1 & 2\\ -1 & 1\end{bmatrix}$

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

Answer: B

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52. If $A=[a_{ij}]_{m\times n} isamatrixofrankrthen(A)$rltmin{m,n}$(B)$ rlemin{m,n}(C)r=min{m,n}` (D) none of these

A. $r=\min(m, n)$

B. $r < \min(m, n)$

C. $r < \min(m, n)$

D. none of these

Answer: C

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53. If I_n is the identity matrix of order n, then rank of I_n is

A. 1

B. n

C. 0

D. none of these

Answer: B

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54. If $A = [a_{ij}]_{m \times n}$ is a matrix of rank r and B is a square submatrix of order r + 1, then

A. B is invertible

B. B is not invertible

C. B many or may be invertible

D. none of these

Answer: B

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55. The rank of a null matrix is

A. 0

B. 1

C. does not exist

D. none of these

Answer: C

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56. If $A = [a_{ij}]_{m \times n}$ is a matrix and B is a non-singular square submatrix of order r, then

A. rank of A is r

B. rank of A is greater than r

C. rank of A is less than r

D. none of these

Answer: B

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57. Which of the following is correct ?

A. Determinant is a sqaure matrix

B. Determinnant is a number associated to a matrix

C. Determinnant is a number associated to a square matrix

D. none of these

Answer: C

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58. If a square matrix A is orthogonal as well as symmetric, then

A. A is involutory matrix

B. A is idempotent matrix

C. A is a diagonal matrix

D. none of these

Answer: A

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

A. 0

B. 1

C. -1

D. none of these

Answer: A

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

A. is a square

B. is not a square

C. is always zero

D. none of these

Answer: A

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61. If A is an orthogonal matrix, then

A. $|A| = 0$

B. $|A| = \pm 1$

C. $|A| = \pm 2$

D. none of these

Answer: B

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62. Let A be a non-singular square matrix of order n. Then; $|adjA| = |A|^{n-1}$

A. $|A|^n$

B. $|A|^{n-1}$

C. $|A|^{n-2}$

D. none of these

Answer: B

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63. Let $A = [a_{ij}]_{n \times n}$ be a square matrix of order 3 such that |A|=-7 and let c_{ij} be cofactor of a_{ij} in A. then $\sum_{i=1}^{3} a_{i2}A_{i2}$ equal

A. 7

B. -7

C. 0

D. 49

Answer: D

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64. If A is a non-singlular square matrix of order n, then the rank of A is

A. equal to n

B. less than n

C. greater than n

D. none of these

Answer: A

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65. If A is a matrix such that there exists a square submatrix of order r which is non-singular and eveny square submatrix or order r + 1 or more is singular, then

A. rank (A) = r + 1

B. rank (A) = r

C. rank (A) gt r

D. rank $(A) < r + 1$

Answer: B

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66. Let A be a matrix of rank r. Then,

A. rank $(A^T) = r$

B. rank $(A^T) < r$

C. rank $(A^T) > r$

D. none of these

Answer: A

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67. Let $A = [a_{ij}]_{m \times n}$ be a matrix such that $a_{ij} = 1$ for all I,j. Then ,

A. rank (A) $>$ 1

B. rank (A) = 1

C. rank (A) = m

D. rank (A) = n

Answer: B

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68. If A is a non-zero column matrix of order $m \times 1$ and B is a non-zero row matrix order $1 \times n$, then rank of AB equals

A. m

B. n

C. 1

D. none of these

Answer: C

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69. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$, is

A. 1

B. 2

C. 3

D. 4

Answer: C

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70. If A is an invertible matrix then $\det(A^{-1})$ is equal to

A. det (A)

B. $\frac{1}{\det(A)}$

C. 1

D. none of these

Answer: B

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71. If A and B are two matrices such that rank of A = m and rank of B = n, then

A. rank (AB)= mn

B. $\text{rank } (AB) > \text{ rank } (A)$

C. $\text{rank } (AB) > \text{ rank } (B)$

D. $\text{rank } (AB) < \text{ min (rank A, rank B)}$

Answer: D

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72. If $A = \begin{bmatrix} 3 & 4 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & -2 \\ 0 & -1 \end{bmatrix}, \text{ then } (A + B)^{-1} =$

A. is a skew-symmetric matrix

B. $A^{-1} + B^{-1}$

C. does not exist

D. none of these

Answer: D

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73. Let $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then A^n is equal to

A. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a \end{bmatrix}$

B. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$

C. $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a^n \end{bmatrix}$

D. $\begin{bmatrix} na & 0 & 0 \\ 0 & na & 0 \\ 0 & 0 & na \end{bmatrix}$

Answer: C

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74. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $\lim_{n \to \infty} \frac{1}{n} A^n$ is

A. a null matrix

B. an identity matrix

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

D. none of these

Answer: A

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75. If $A = \begin{bmatrix} 1 & 2 & x \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $AB = I_3$, then $x + y$ equals

A. 0

B. -1

C. 2

D. none of these

Answer: A

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76. If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$ then find $\lim_{n - \infty} \frac{1}{n} A^n$

A. $\begin{bmatrix} 0 & a \\ 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$

D. none of these

Answer: A

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77. If the matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is commutative with matrix $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then

A. $a=0, b=c$

B. $b=0, c=d$

C. $c=0, d=a$

D. $d=0, a=b$

Answer: C

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78. If $A=\begin{bmatrix}1 & 0\\ k & 1\end{bmatrix}$ and $B=\begin{bmatrix}0 & 0\\ k & 0\end{bmatrix}$ such that $A^{100}-I=\lambda B$, then $\lambda=$

A. 99

B. 100

C. 10

D. 49

Answer: B

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79. If matrix A has 180 elements, then the number of possible orders of A is

A. 18

B. 10

C. 36

D. 35

Answer: A

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80. A 3×3 matrix A, with 1st row elements as 2,-1,-1 respectively, is modified as below to get another matrix B.

R_1 elements of A go to R_3 of matrix C

R_2 elements of A go to R_1 of matrix C

R_2 elements of A to R_1 of matrix C

R_3 elements of A go to R_2 fo matrix C

Now, below operations are done on C as follow,

C_1 elements of C go to C_3 of B

C_2 elements of C go to C_1 of B

C_3 elements of C go to C_2 of B

It is found that A = B, then

A. A is symmetric matrix

B. A is an upper triangular matrix

C. A is singular matrix

D. none of these

Answer: C

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Chapter Test

1. If A is an invertible matrix and B is a matrix, then

A. rank (AB) = rank (A)

B. rank (AB) = rank (B)

C. rank (AB) gt rank (A)

D. rank (AB) gt rank (B)

Answer: b

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2. What is the order of the product $\begin{bmatrix} x & y & z \end{bmatrix}\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$

A. 3×1

B. 1×1

C. 1×3

D. 3×3

Answer: B

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3. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}, \quad \text{then} \quad A^{-1}$, is

A. $\begin{bmatrix} 1/a & 0 & 0 \\ 0 & 1/b & 0 \\ 0 & 0 & 1/c \end{bmatrix}$

B. $\begin{bmatrix} -1/a & 0 & 0 \\ 0 & -1/b & 0 \\ 0 & 0 & -1/c \end{bmatrix}$

C. $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & 1/c \end{bmatrix}$

D. none of these

Answer: A

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4. The inverse of the matrix $\begin{bmatrix} 1 & 3 \\ 3 & 10 \end{bmatrix}$ is equal to

A. $\begin{bmatrix} 10 & 3 \\ 3 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 10 & -3 \\ -3 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 3 \\ 3 & 10 \end{bmatrix}$

D. $\begin{bmatrix} -1 & -3 \\ -3 & -10 \end{bmatrix}$

Answer: B

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5. If $A = \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}, \quad \text{then} \quad A^{-1} =$

A. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Answer: a

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6. If $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, the value of X^n is equal to

A. $\begin{bmatrix} 3n & -4n \\ n & -n \end{bmatrix}$

B. $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$

C. $\begin{bmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{bmatrix}$

D. none of these

Answer: d

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7. If $A = \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}$, then $A^{-1} =$

A. $\begin{bmatrix} 1 & -2 \\ -3 & 5 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 2 \\ 3 & -5 \end{bmatrix}$

C. $\begin{bmatrix} -1 & -2 \\ -3 & -5 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$

Answer: B

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8. For the system of equaltions :

$x + 2y + 3z = 1$

$2x + y + 3z = 2$

$5x + 5y + 9z = 4$

A. there is only one solution

B. there exists infinitely many solution

C. there is no solution

D. none of these

Answer: A

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

A. $\begin{bmatrix} 8 & -5 \\ -5 & 3 \end{bmatrix}$

B. $\begin{bmatrix} 8 & -5 \\ 5 & 3 \end{bmatrix}$

C. $\begin{bmatrix} 8 & -5 \\ -5 & -3 \end{bmatrix}$

D. $\begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$

Answer: d

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10. if $\begin{vmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{vmatrix}$ is a symmetric then $x =$

A. 3

B. 5

C. 2

D. 4

Answer: b

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11. If $A+B=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ and $A-2B=\begin{bmatrix}-1 & 1\\ 0 & -1\end{bmatrix}$, then $A=$

A. $\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}$

B. $\begin{bmatrix}2/3 & 1/3\\ 1/3 & 2/3\end{bmatrix}$

C. $\begin{bmatrix}1/3 & 1/3\\ 2/3 & 1/3\end{bmatrix}$

D. none of these

Answer: C

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12. $\begin{bmatrix}-6 & 5\\ -7 & 6\end{bmatrix}^{-1}=$

A. $\begin{bmatrix}-6 & 5\\ -7 & 6\end{bmatrix}$

B. $\begin{bmatrix} 6 & -5 \\ -7 & 6 \end{bmatrix}$

C. $\begin{bmatrix} 6 & 5 \\ 7 & 6 \end{bmatrix}$

D. $\begin{bmatrix} 6 & -5 \\ 7 & -6 \end{bmatrix}$

Answer: A

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13. From the matrix equation AB = AC we can conclude B = C provided that

A. A is singular

B. A is non-singular

C. A is symmetric

D. A is square

Answer: B

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14. If I_3 is the identily matrix of order 3, then $(I_3)^{-1} =$

A. 0

B. $3I_3$

C. I_3

D. not necessarily exists.

Answer: c

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15. Let a, b, c be positive real numbers. The following system of equations in x,y and z

$\frac{x^2}{a^2} = \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1, \frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1, -\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ has

A. no solution

B. unique solution

C. infinitely many solutions

D. finitely many solutions

Answer: b

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16. If A and B are two matrices such that A+B and AB are both defind, then

A. A & B are two matrices not necessarily of same order

B. A and B are square matrices of same order

C. number of columns of A = number of rows of B

D. none of these

Answer: B

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17. A and B are tow square matrices of same order and A' denotes the transpose of A, then

A. $(AB)' = B'A'$

B. $(AB)' = A'B'$

C. $AB = 0 \Rightarrow |A| = 0 \text{ or } |B| = O$

D. $AB = 0 \Rightarrow A = 0 \text{ or } B = 0$

Answer: A

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18. Consider the system of equations

$a_1x + b_1y + c_1z = 0$

$a_2x + b_2y + c_2z = 0$

$a_3x + b_3y + c_3z = 0$

if $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the system has

A. more than two solutions

B. one trivial and one non-trivial solutions

C. no solution

D. only trivial solution (0,0,0)

Answer: a

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19. The system of linear equations

$x + y + z = 2$

$2x + y - z = 3$

$3x + 2y + kz = 4$ has a unique solution if

A. $k \neq 0$

B. $-1 < k < 1$

C. $-2 < k < 2$

D. k = 0

Answer: A

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20. If A and B are square matrices of order 3 such that $|A| = -1, |B| = 3, \text{ then } |3AB|$ equals

A. -9

B. -81

C. -27

D. 81

Answer: A

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21. If the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) are collinear, then the rank of the matrix $\begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}$ will always be less than

A. 3

B. 2

C. 1

D. none of these

Answer: a

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22. Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$. If B is the inverse of A, then α is :

A. 5

B. -1

C. 2

D. -2

Answer: a

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23. Let $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$. The only correct statement aboul the matrix A is

A. $A^2 = I$

B. A = -I, where I is a unit matrix

C. A^{-1} does not exist

D. A is a zero matrix

Answer: c

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24. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$ and $adjA = \begin{bmatrix} 6 & -2 & -6 \\ -4 & 2 & x \\ y & -1 & -1 \end{bmatrix}$,then x + y =

A. 6

B. -1

C. 3

D. 1

Answer: a

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25. If A is a square matrix such that $A(adjA) = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ then $|adjA|$ =

A. 4

B. 16

C. 64

D. 256

Answer: B

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26. If n is a natural number. Then $\begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}^n$, is

A. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if n is even

B. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if n is odd

C. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if n is a natural number

D. none of these

Answer: a

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27. If

$x^2 + y^2 + z^2 \neq 0, x = cy + bz, y = az + cx$ and $z = bx + ay$ then $a^2 +$

A. 2

B. a + b + c

C. 1

D. ab + bc + ca

Answer: c

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28. If A is a singular matrix, then A (adj A) is a

A. scalar matrix

B. zero matrix

C. identity matrix

D. orthogonal matrix

Answer: B

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29. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$,I is the unit matrix of order 2 and a, b are arbitray constants, then $(aI + bA)^2$ is equal to

A. $a^2 I - abA$

B. $a^2 I + 2abA$

C. $a^2 I + b^2 A$

D. none of these

Answer: b

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30. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then which one of the following is not correct?

A. A is orthogonal matrix

B. A' is orthogonal matrix

C. $|A| = 1$

D. A is not invertible

Answer: D

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