MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

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

A. 2^3

B. 2^6

C. 2^9

D. 18

Answer: B

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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. $\dfrac{n(n-1)}{2}$

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

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

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. Find the value of x for which the matrix product $[2070101-21][-x14x7x010x-4x-2x]$ equal to an identity matrix.

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 $M[010]=M[1-10]=[11-1], andM[111]=[0012]$ Then the sum of the diagonal entries of M is ________.

A. 7

B. 8

C. 9

D. 6

Answer: C

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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 $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}, then A. A'$ is

A. I

B. A

C. $-A$

D. A^2

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 $(A+B)^2 = A^2 + B^2$, the value of a + b is

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. 2

B. 3

C. 4

D. 6

Answer: A

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11. If $A = \begin{bmatrix} -4 & -1 \\ 3 & 1 \end{bmatrix}$, then the determinant 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 $P = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 9 & 3 & 1 \end{bmatrix}$ and Q = $[q_{ij}]$ be two 3×3 matrices such that $Q - P^5 = I_3$. Then $\dfrac{q_{21} + q_{31}}{q_{32}}$ is equal to

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 $\omega \neq 1 and P = \left[p_{ij}\right]$ be a $n \times n$ matrix withe $p_{ij} = \omega^{i+j}$. Then $p^2 \neq O, when =$ a.57 b. 55 c. 58 d. 56

A. 57

B. 55

C. 58

D. 56

Answer: A

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14. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}, a, b \in N.$ 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 $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then find the values of θ satisfying the equation $A^T + A = I_2$.

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

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

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

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 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 a 3×3 non-singular matrix such that $AA' = A'A$ and $B = A^{-1}A'$ then BB' equals to

A. B^{-1}

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

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) 2 (B) 0 (C) 3 (D) 1

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 S 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 adj $\left(3A^2 + 12A\right)$ is equal to

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 $A(adjA) = AA^T$, 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)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 the equation $x^2 - x + 2 = 0$, then A^{-1} is equal to

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.

Which one of the following it true?

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 $P = [1\alpha 3133244]$ is the adjoint of a 3×3 matrix A and $|A| = 4$, then a is equal to (1) 11 (2) 5 (3) 0 (4) 4

A. 4

B. 11

C. 5

D. 10

Answer: B

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34. If for a matrix A, $|A| = 6 \text{ and } adjA =$ {:[(1,-2,4),(4,1,1),(-1,k,0)]:}`, then k is equal to

A. -1

B. 0

C. 1

D. 2

Answer: B

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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 1) orthogonal 2) involutory 3) idempotent 4) nilpotent

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

A. 1

B. 2

C. 3

D. none of these

Answer: B

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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 $\lambda = ..., k \neq ....$

A. $\lambda = 1$

B. $\lambda = 2$

C. $\lambda = -2$

D. $\lambda = 3$

Answer: D

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43. Determine for that values of λ and μ the following system of equations

$x + y + xz = 6, x + 2y + 43z = 10$ and x+2y+lambdaz=mu` have (i) no solution (iii) a unique solution ? (iii) an infine number of solution?

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 $\alpha, \lambda, \mu \in R$.Consider the system of linear equations

$\alpha x + 2y = \lambda$

$3x - 2y = \mu$

Which of the following 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 $x = cy + bz, y = az + cx, z = x + ay, where. x, y, z$ are not all zeros, then find the value of $a^2 + b^2 + c^2 + 2abc \cdot$

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. 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 A and B arȩ square matrices of same order 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. about to only mathematics

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

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 $\begin{bmatrix}\frac{\cos(2\pi)}{7} & -\frac{\sin(2\pi)}{7} \frac{\sin(2\pi)}{7} \frac{\cos(2\pi)}{7}\end{bmatrix} = [1001]$, then the least positive integral value of k is (a) 3 (b) 4 (c) 6 (d) 7

A. 3

B. 4

C. 6

D. 7

Answer: D

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6. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, $n \in N$, then A^{4n} equals $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

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 amtrix, then adj A is

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 AB is non-singular (b) AB is singular (c) $(AB)^{-1} = A^{-1}B^{-1}$ (d) $(AB)^{-1}$ 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. $(A^T)^{-1} = (A^{-1})^T$

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

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

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

Answer: B

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10. If the matrix AB is zero, then It is not necessary that either $A = O$ or, $B = O$ (b) $A = O$ or $B = O$ (c) $A = O$ and $B = 0$ (d) all the above statements are wrong

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 $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}, a \neq 0$ then | adj A| is equal to

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 (adjA)) 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 $A\ (adj\ A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, 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 non-singular and $AB = O$, then B is a (a) null matrix (b) singular matrix (c) unit matrix (d) non-singular matrix

A. null matrix

B. singular matrix

C. unit matrix

D. non-singular matrix.

Answer: A

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16. If $A = [n000n000n]$ and $B = [a_1 a_2 a_3 b_1 b_2 b_3 c_1 c_2 c_3]$, then AB is equal to B (b) nB (c) B^n (d) $A + B$

A. BA=I

B. nB

C. B^n

D. A + B

Answer: B

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17. If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$, then A^n (where $n \in N$) equals (a) $\begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & n^2 a \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & na \\ 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} n & na \\ 0 & n \end{bmatrix}$

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

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

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 $A^5 = 0$ such that $A^n \neq I$ for $1 \leq n \leq 4$, 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

(a)$\lambda \neq 1$ (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: $x+y+z=5, \; x+2y+3z=9$ and $x+3y+\lambda z=\mu$ has a unique solution, if

(a) $\lambda=5, \mu=13$

(b) $\lambda \neq 5$

(c)$\lambda=5, \mu \neq 13$

(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 $A=\begin{bmatrix} I & 1-2i \\ -1-2i & 0 \end{bmatrix}, where I=\sqrt{-1},$ is

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 $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, find the values of α for which $A^2 = B$.

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 elemant in the first row and third coumn 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. about to only mathematics

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 $\begin{bmatrix} a & b \\ 2 & 0 \end{bmatrix}^{-1} =$

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 $A^2 - A + I = 0$, 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 a 3×3 amtrix and B is its adjoint such that $|B| = 64$, then $|A|$ is equal to

A. 64

B. $p \pm 64$

C. ± 8

D. 18

Answer: C

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

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 (A(adjA)A^{-1})A is equal to

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 $(A-2I)(A-4I)=0, then, \frac{1}{6}A+\frac{4}{3}A^{-1}$ is equal to a.$0I$ 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. $|A|A$

B. $|A|^2 A$

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

D. none of these

Answer: A

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35. If A and B are squre 3×3 such that A is an orthogonal matrix and B is a skew- symmetrix matrix , then which of the following statement is true?

A. $|AB| = 1$

B. $|AB| = 0$

C. $|AB| = -1$

D. none of these

Answer: B

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36. If $A = \begin{vmatrix} \alpha & 2 \\ 2 & \alpha \end{vmatrix}$ and $|A|^3 = 125$, 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. about to only mathematics

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) is :

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. If `U={:[(1,2,2),(-2,-1,-1),(1,-4,-3)]:}' ,sum of elements of inverse of U 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 f are square matrices of size $n \times n$ such that $A^2 - B^2 = (A - B)(A + B)$ 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 $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ Then only correct statement about the matrix A is (A) A is a zero matrix (B) $A^2 = 1$ (C) A^{-1} does not exist (D) $A = (-1)$ I where I is a unit matrix

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 find the value α.

A. 2

B. -1

C. 3

D. 5

Answer: D

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46. Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}.If\left|A^2\right| = 25,$ 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. The value of a,b,c when $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ is orthogonal , are :

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

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

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

D. 1

Answer: C

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49. If $A = [a_{ij}]_{n \times n}$, 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 $a_{ij} = \left\{2, when i = j0, when i \neq j, then \left\{\frac{\det(adj(adjA))}{7}\right\}\right.$ is (where

{.} represents fractional part function) $1/7$ b. $2/7$ c. $3/7$ 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 $2 \text{ and } B = \begin{bmatrix} 1 & 4 \\ 2 & 9 \end{bmatrix} \text{ and } c\begin{bmatrix} 9 & -4 \\ -2 & 1 \end{bmatrix}$ 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 $PQ = kI$, where $k \in \mathbb{R}, k \neq 0$ and $I$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 $z = \frac{-1+\sqrt{3}i}{2}$, where $i = \sqrt{-1}$, and $r, s \in \{1, 2, 3\}$. Let $P = \begin{bmatrix} (-z)^r & z^{2s} \\ z^{2s} & z^r \end{bmatrix}$ and I be the identity matrix of order 2. Then the total number of ordered pairs (r, s) for 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 ?

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 $|\mathrm{adj}\ (\mathrm{adj}\ \mathrm{A})|$ 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| =

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

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

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

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

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 $A \neq I \text{ and } A \neq -I$ then det $A = -I$

Statement-2 If $A \neq I \text{ and } A \neq -1$, then $tr(A) \neq 0$.

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. Define Tr(A)= 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 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.

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. If an upper triangular matrix $A = [a]_{n \times n}$ the elements $a_1 = 0$ for

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 mxn matrix and B is a 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. If $A = \begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix}$ and $B = \begin{bmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{bmatrix}$ are two matrices such that AB is the null matrix, then

A. 0

B. multiple of π

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

D. none of these

Answer: C

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6. The matrix X in the equation AX=B, such that $A = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$ is given by

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 $I = [1001]$, $J = [01 - 10]$ and $B = [\cos\theta \sin\theta - \sin\theta \cos\theta]$, then B equals $I\cos\theta + J\sin\theta$ (b) $I\sin\theta + J\cos\theta$ (c) $I\cos\theta - J\sin\theta$ (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.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 $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, 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 A and B arę square matrices of same order 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 matrixfand $n \in N$, 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 $A = \left[a_{ij}\right]$ 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 $A = \begin{bmatrix} 1 & x \\ x^7 & 4y \end{bmatrix}, B = \begin{bmatrix} -3 & 1 \\ 1 & 0 \end{bmatrix}$ 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. $k^{n+1} adjA$

Answer: C

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28. If A is a singular amtrix, then adj A is

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

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30. If A is a singular amtrix, then adj A is

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 $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ 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. $\alpha = 2ab, \beta = a^2 + b^2$

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

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38. 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. 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. 0

Answer: A

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40. If $f(\alpha) = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}, then$ prove that $[F(\alpha)]^{-1} = F(-\alpha)$.

A. $F(-\alpha)$

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

C. $F(2\alpha)$

D. none of these

Answer: A

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41. If $F(x)=\begin{bmatrix}\cos x & -\sin x & 0\\ \sin x & \cos x & 0\\ 0 & 0 & 1\end{bmatrix}$ and $G(y)=\begin{bmatrix}\cos y & 0 & \sin y\\ 0 & 1 & 0\\ -\sin y & 0 & \cos y\end{bmatrix}$,

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. $G(y^{-1})F(x^{-1})$

Answer: C

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42. Find the matrix A satisfying the matrix equation

$$\begin{bmatrix}2 & 1\\ 3 & 2\end{bmatrix}A\begin{bmatrix}-3 & 2\\ 5 & -3\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

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 $a = 1, \quad b = 0$ (b) $a = \cos 2\,\theta, \quad b = \sin 2\,\theta$ (c) $a = \sin 2\,\theta, \quad b = \cos 2\theta$ (d) none of these

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 two matrices such that A+B and AB are both defind, 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 $3\,A^3+2\,A^2+5\,A+I=0$, then A^{-1} is equal to $-\left(3A^2+2A+5\right)$ (b) $3A^2+2A+5$ (c) $3\,A^2-2A-5$ (d) none of these

A. $-\left(3A^2+2A+5\right)$

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. 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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48. 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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49. If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be square root of two-rowed unit matrix, then α, β and γ should satisfy the relation. a. $1-\alpha^2+\beta\gamma=0$ b. $\alpha^2+\beta\gamma=0$ c. $1+\alpha^2+\beta\gamma=0$ d. $1-\alpha^2-\beta\gamma=0$

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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50. If for matrix $A, A^2 + I = 0$, where I is the identity matrix, then A equals

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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51. If $A = [a_{ij}]_{m \times n}$ is a matrix of rank r then (A) $r = \min\{m, n\}$ (B) $r \leq \min\{m, n\}$ (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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52. 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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53. $A = [a_{ij}]_{m \times n}$ is a square matrix, if

A. $m < n$

B. $m > n$

C. $m = n$

D. None of these

Answer: C

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54. 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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55. 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 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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56. Which of the following is correct ?

A. Determinant is a sqaure matrix

B.

C. Determinnant is a number associated to a square matrix

D. none of these

Answer: C

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57. 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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58. 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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59. 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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60. 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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61. Let A be a non-singular square matrix of order n. Then; `|adjA| =

A. $|A|^n$

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

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

D. none of these

Answer: B

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62. Let $A = [a_{ij}]_{n \times n}$ be a square matrix and let c_{ij} be cofactor of a_{ij} in A. If C=$[C_{ij}]$, then

A. $|C| = |A|$

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

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

D. none of these

Answer: B

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63. 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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64. 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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65. 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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66. Let $A = [a_{ij}]_{m \times n}$ be a matrix such that $a_{ij} = 1$ for all I,j. Then ,

A. rank (A) gt 1

B. rank (A) = 1

C. rank (A) = m

D. rank (A) = n

Answer: B

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67. 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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68. 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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69. If A is an invertible matrix, then $\det(A-1)$ is equal to

A. det (A)

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

C. 1

D. none of these

Answer: B

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70. 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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71. If $A = [3424]$, $B = [-2-20-1]$, then $(A+B)^{-1}$ (a) is a skew-symmetric matrix (b) $A^{-1}+B^{-1}$ (c) does not exist (d) none of these

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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72. Let $A = [a000a000a]$, then A^n is equal to $[a^n000a^n000a]$ (b) $[a^n000a000a]$ (c) $[a^n000a^n000a^n]$ (d) $[na000na000na]$

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

A. 0

B. -1

C. 2

D. none of these

Answer: A

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75. 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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76. 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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77. 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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78. 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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79. 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 $A = \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}, \quad \text{then} \quad A^{-1} =$

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 equations:

$x + 2y + 3z = 1$

$2x + y + 3z = 2$

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

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

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 $A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is symmetric, then x is equal to

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 is equal to

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 conclude B=C provided.

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 real numbers. The following system of equations in x, y and z

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

a. no solution b. unique solution c. infinitely many solutions d. finitely many solutions

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. STATEMENT-1: The lines $a_1x + b_1y + c_1 = 0a_2x + b_2y + c_2 = 0, a_3x + b_3y + c_2 = 0$ are concurrent if $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0.$

STATEMENT-2: The area of the triangle formed by three concurrent lines is always zero.

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) $k = 0$

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 ar square matrices of order 3 such that |A|=-1|B|=3, then |3AB| is equal to

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 find the value α.

A. 5

B. -1

C. 2

D. -2

Answer: a

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23. Let $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ Then only correct statement about the matrix A is (A) A is a zero matrix (B) $A^2 = 1$ (C) A^{-1} does not exist (D) $A = (-1)$ I where I is a unit matrix

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 $A \cdot (AdjA) = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$, then

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. Given x=cy+bz,y=az+cx and that $a^2 + b^2 + c^2$+2abc =1.

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. $a^2I - abA$

B. $a^2I + 2abA$

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

D. none of these

Answer: d

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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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