MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MATRICES

Topical Problems

1. The lower triangular matrix of matrix $\begin{bmatrix} 3 & -1 & 2 \\ 4 & -1 & 2 \\ 5 & 2 & 1 \end{bmatrix}$ is

A. $\begin{bmatrix} 3 & 0 & 0 \\ 4 & -1 & 0 \\ 5 & 2 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 0 & 0 \\ 4 & 1 & 0 \\ 5 & 2 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 3 & 0 & 0 \\ 4 & 0 & 0 \\ 5 & 2 & 0 \end{bmatrix}$

D. None of these

Answer: A

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2. If $A = \begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -5 \\ 3 & 1 \end{bmatrix}$ then sum of diagonal elements of $(A + B)$ is

A. -6

B. 6

C. 3

D. 2

Answer: B

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3. If $2A + 3B = \begin{bmatrix} 2 & -1 & 4 \\ 3 & 2 & 5 \end{bmatrix}$ and $A + 2B = \begin{bmatrix} 5 & 0 & 3 \\ 1 & 6 & 2 \end{bmatrix}$, then B is

A. $\begin{bmatrix} 8 & -1 & 2 \\ -1 & 10 & -1 \end{bmatrix}$

B. $\begin{bmatrix} 8 & 1 & 2 \\ -1 & 10 & -1 \end{bmatrix}$

C. $\begin{bmatrix} 8 & 1 & -2 \\ -1 & 10 & -1 \end{bmatrix}$

D. $\begin{bmatrix} 8 & 1 & 2 \\ 1 & 10 & 1 \end{bmatrix}$

Answer: B

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4. If $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$, then AB will be

A. $\begin{bmatrix} 17 & 0 \\ 4 & -2 \end{bmatrix}$

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

C. $\begin{bmatrix} 17 & 4 \\ 0 & -2 \end{bmatrix}$

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

Answer: A

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5. If $\begin{bmatrix} x-y-z \\ -y+z \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 5 \\ 3 \end{bmatrix}$ then the values of x, y and z are respectively

A. $5, 2, 2$

B. $1, -2, 3$

C. $0, -3, 3$

D. $11, 8, 3$

Answer: B

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6. If A is a square mastrix, then

A. $A + A^T$ is symmetric matrix

B. AA^T is skew- symmetric matrix

C. $A^T + A$ is skew- symmetric matrix

D. $A^T A$ is skew -symmetric matrix

Answer: A

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7. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and A^2 is the identity matrix, then x is equal to

A. -1

B. 0

C. 1

D. 2

Answer: B

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8. If $A = \begin{vmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{vmatrix}$ then A^4 is equal to (A) 27A (B) 81A (C) 243A (D) 729A

A. $27A$

B. $81A$

C. $243A$

D. $729A$

Answer: D

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9. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then $A^2 - 4A$ is equal to

A. $2I_3$

B. $3I_3$

C. $4I_3$

D. $5l_3$

Answer: D

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10. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and l is the unit matrix of order 2, then A^2 equals to

A. $4A - 3l$

B. $3A - 4l$

C. $A - l$

D. $A + l$

Answer: A

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11. If $A = \begin{bmatrix} 1 & -5 & 0 \\ 0 & 7 & 0 \\ 11 & 1 & 9 \end{bmatrix}$ then trace of matrix A is

A. 17

B. 25

C. 3

D. 12

Answer: A

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12. 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. $AB = BA$

B. Either of A or B is a zero matrix

C. Either of A or B is na identity matrix

D. $A = B$

Answer: A

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13. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$,then A^{100} is equal to

A. $2^{100}A$

B. $2^{99}A$

C. $100A$

D. $299A$

Answer: B

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14. If a square matrix A is such that $AA^T = l = A^T A$, then $|A|$ is equal to

A. 0

B. ± 1

C. ± 2

D. None of these

Answer: B

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

A. 1

B. -1

C. 4

D. None of these

Answer: D

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

A. A and B are need not be of same order

B. A is order $m \times m$ and B is of order $n \times n$

C. Both are of same order $n \times n$

D. A is of order $m \times n$ and B is of order $n \times m$

Answer: C

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17. Which of the following is a skew symmetric matrix?

A. $\begin{bmatrix} 3 & 1 & 2 \\ 1 & 4 & 6 \\ 2 & 6 & 5 \end{bmatrix}$

B. $\begin{bmatrix} 2 & -1 & 3 \\ 1 & 1 & 4 \\ -3 & -4 & 6 \end{bmatrix}$

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

D. None of these

Answer: C

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18. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 17 \\ 0 & -10 \end{bmatrix}$ then $|AB|$ is equal to

A. 80

B. 100

C. -110

D. 92

Answer: B

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19. If $A = \begin{bmatrix} 4 & 5 & 6 \\ 3 & -1 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ then minor M_{23} of matrix A' is

A. -2

B. 4

C. 3

D. 1

Answer: A

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20. If $A = \begin{bmatrix} 1 & -1 & 3 \\ 3 & 2 & 1 \\ 4 & 5 & 6 \end{bmatrix}$ then cofactor of A_{22} is

A. 3

B. -6

C. 6

D. -3

Answer: B

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21. The adjoint of a matrix $A = \begin{bmatrix} 3 & 1 & 2 \\ 4 & 5 & -1 \\ 3 & 2 & -1 \end{bmatrix}$ is

A. $\begin{bmatrix} -7 & 1 & -7 \\ 5 & -9 & -3 \\ -11 & 11 & 11 \end{bmatrix}$

B. $\begin{bmatrix} -7 & 5 & -11 \\ 1 & -9 & 11 \\ -7 & -3 & 11 \end{bmatrix}$

C. $\begin{bmatrix} -7 & 5 & -11 \\ 1 & -9 & 11 \\ -7 & 3 & 11 \end{bmatrix}$

D. None of these

Answer: B

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22. If $A = \left[\left(1, \sin\frac{\alpha}{2}\right), \left(-\sin\frac{\alpha}{2}, 1\right]\right.$ then adj A is

A. $\begin{bmatrix} -1 & \sin\frac{\alpha}{2} \\ -\sin\frac{\alpha}{2} & -1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -\sin\frac{\alpha}{2} \\ \sin\frac{\alpha}{2} & 1 \end{bmatrix}$

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

D. None of these

Answer: B

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23. If $A = \begin{bmatrix} 3 & 2 & -1 \\ 4 & -1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$ then adj (adjA) is

A. $32A$

B. $-32A$

C. $33A$

D. $-35A$

Answer: B

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24. If $A = \begin{bmatrix} 4 & 5 \\ 3 & 1 \end{bmatrix}$ then $|adjA|$ is

A. -12

B. 11

C. -11

D. 12

Answer: C

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25. Let for any matrix M, M^{-1} exists, which of the followint is not true?

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

B. $\left(M^2\right)^{-1} = \left(M^{-1}\right)$

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

D. $\left(M^{-1}\right)^{-1} = M$

Answer: B

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26. If $A = \begin{bmatrix} x & -2 \\ 3 & 7 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} \frac{7}{34} & \frac{1}{17} \\ \frac{-3}{34} & \frac{2}{17} \end{bmatrix}$,then the value of x is

A. 2

B. 3

C. -4

D. 4

Answer: D

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27. If $\begin{bmatrix} 1 & -1 & x \\ 1 & x & 1 \\ x & -1 & 1 \end{bmatrix}$ has no inverse, then the real value of x is

A. 2

B. 3

C. 0

D. 1

Answer: D

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28. If A and B are square matrices of the same order and $AB = 3l$ then A^{-1} is equal to

A. $3B$

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

C. $3B^{-1}$

D. $\frac{1}{3}B^{-1}$

Answer: B

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29. If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$ then x equals to

A. 2

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

C. 1

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

Answer: D

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30. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then A^{-1} is equal to

A. $-\frac{1}{2}\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

B. $\frac{1}{2}\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

C. $\begin{bmatrix} -2 & 4 \\ 1 & 3 \end{bmatrix}$

D. $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$

Answer: A

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31. The matrix A satisfying the equation $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ is

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

Answer: C

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32. If $A = \begin{bmatrix} 1 & x \\ x^2 & 4y \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 1 \\ 1 & 0 \end{bmatrix}$, $adj(A) + B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then the values of x and y are

A. 1,1

B. $\pm 1, 1$

C. 1,0

D. None of these

Answer: A

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33. Inverse of the matrix $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$ is

A. $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

B. $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{bmatrix}$

C. $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

D. $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

Answer: D

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34. If $A = \begin{bmatrix} a & b & 0 \\ -b & a & 0 \\ 0 & 0 & 1 \end{bmatrix}$ where $a^2 + b^2 = 1$, then $adj(A)$ is equals to (here A^T is the tranpose of A)

A. A^{-1}

B. A^T

C. A

D. $-A$

Answer: A

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35. If $\begin{bmatrix} 2 & -1 & 3 \\ 1 & 3 & -1 \\ 3 & 2 & 1 \end{bmatrix}, \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 9 \\ 4 \\ 10 \end{bmatrix}$,then $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is equal to

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

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

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

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

Answer: C

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36. The real value of k for which the sysmtem of equation $2kx - 2y + 3z = 0, x + ky + 2z = 0, 2x + kz = 0$ has non-trivial solution is

A. 2

B. -2

C. 3

D. 3

Answer: A

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37. The system of equations $2x + h - 5 = 0, x - 2h + 1 = 0, 2x - 14y - a = 0$, is cosistent. Then a is equal to

A. 1

B. 2

C. 5

D. None of these

Answer: D

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38. The number of non-trivial solutions of the system $x = y + z = 0, x + 2y - z = 0, 2x + y + 3z = 0$, is

A. 0

B. 1

C. 2

D. 3

Answer: A

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39. The simultaneous equations $Kx + 2y - z = 1, (K-1)y - 2z = 2$ and $(K+2)z = 3$ have only one solution, when

A. $K = -2$

B. $K = -1$

C. $K = 0$

D. $K = 1$

Answer: B

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40. The values of a for which the system of equations $x + y + z = 0, x + ay + az = 0$ and $x - ay + z = 0$, possesses non-zero solutions, are given by

A. 1,2

B. 1,-1

C. 1,0

D. None of these

Answer: B

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41. The value of λ such that $x+3y+\lambda z=0, 2x+4y-z=0, x+5y-2z=0$ has a nontrivial solution is

A. -1

B. 0

C. 1

D. 2

Answer: A

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42. For what value of k the following system of linear equations wil have infinite solutions $x - y + z = 3, 2x + y - z = 2$ and $-3x - 2ky + 6z = 3$

A. $k \neq 2$

B. $k = 0$

C. $k = 3$

D. $k\varepsilon[2, 3]$

Answer: C

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43. Consider the system of linear equations:

$x_1 + 2x_2 + x_3 = 3$

$2x_1 + 3x_2 + x_3 = 3$

$3x_1 + 5x_2 + 2x_3 = 1$

The system has

A. Infinite number of solutions

B. Exactly three solutions

C. A unique solution

D. No solution

Answer: D

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44. The solution of the system of equations is $x - y + 2z = 1, 2y - 3z = 1$ and $3x - 2y + 4y = 2$ is

A. $x = 1, y = 5$ and $z = 3$

B. $x = 0, y = 5$ and $z = 3$

C. $x = 0, y = 5$ and $z = -3$

D. None of the above

Answer: B

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Miscellaneous Problems

1. If A is a 3×4 matrix and B is matrix such that $A^T B$ and BA^T are both define then order of B is :

A. 4×4

B. 3×4

C. 4×3

D. 3×3

Answer: B

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2. Determine the values of x for which the matrix $A = [x + 1 - 34 - 5x + 2241x - 6]$ is singular.

A. $0, \frac{3 \pm \sqrt{205}}{2}$

B. $0, \frac{3}{2}$

C. $0, \pm \frac{\sqrt{205}}{2}$

D. None of these

Answer: A

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3. The matrix $\begin{bmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is invertible if

A. $\lambda \neq -17$

B. $\lambda \neq -18$

C. $\lambda \neq -19$

D. $\lambda \neq 20$

Answer: A

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4. If $A =$ diag (1,4,5) then A^{-1} is equal to

A. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{4} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -\frac{1}{4} & 0 \\ 0 & 0 & -\frac{1}{5} \end{bmatrix}$

D. None of these

Answer: B

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5. If $A = \begin{bmatrix} -\cos\theta & -\sin\theta \\ -\cos\theta & \sin\theta \end{bmatrix}$ and $A(adjA) = \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then λ is equal to

A. $\cos 2\theta$

B. $-\sin 2\theta$

C. $-\cos 2\theta$

D. $\sin 2\theta$

Answer: B

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6. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $adj(adjA)$ is equal to

A. A

B. A'

C. $adjA$

D. $-A$

Answer: A

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7. If A and B are square matrices of the same order such that $(A+B)(A-B)=A^2-B^2$ then $\left(ABA^{-1}\right)^2$ is equal to

A. B^2

B. I

C. A^2B^2

D. A^2

Answer: A

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8. If A and B are two square matrices of order 3×3, then whilch of the following is true?

A. $AB = O \Rightarrow A = O$ or $B = O$

B. $\det(2AB) = 8$ det(A) det(B)

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

D. det (A+B)=$\det$ (A) $+$ det(B)

Answer: B

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9. If $O(A) = 2 \times 3, O(B) = 3 \times 2$ andf $O(C) = 3 \times 3$, which one of the followign is not defined?

A. $CB + A'$

B. BAC

C. $C(A+B')'$

D. $C(A+B')$

Answer: D

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10. 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. unit matrix

B. null matrix

C. diagonal matrix

D. None of these

Answer: B

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11. 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 is a zero matrix

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

C. A^{-1} does not exist

D. $A^2 = l$

Answer: D

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12. If A and B are two square marices of the same order such that $AB = BA$, then $(AB)^n$ is equal to

where $n \varepsilon N$

A. AB

B. $A^n B$

C. $B^n A$

D. $A^n B^n$

Answer: D

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

A. symmetric matrix

B. diagonal matrix

C. skew-symmetric matrix

D. None of these

Answer: A

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

A. there exist more than one but finite number of $B's$ such that $AB = BA$

B. there exists exactly one B such that $AB = BA$

C. there exists infinitely many B's such that $AB = BA$

D. there cannot exist any B such that $AB = BA$

Answer: C

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15. If A is an invertible matrix of order n then determinant of $adj(A)$ is equal to

A. $|A|^n$

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

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

D. $|A|^{n+2}$

Answer: C

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16. Let A, B and C be $n \times n$ matrices. Which one of the following is a correct statement?

A. If $AB = AC$ then $B = C$

B. If $A^3 + 2A^2 + 3A + 5l = O$ then A is invertible

C. If $A^2 = O$ then $A = O$

D. None of the above

Answer: A

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

A. b^3

B. b^9

C. b^6

D. b^8

Answer: B

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18. If $A = \begin{bmatrix} 2 & 3 \\ 1 & -2 \end{bmatrix}$ and $A^{-1} = \alpha A,$ then α is equal to

A. 7

B. -7

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

D. $-\frac{1}{7}$

Answer: C

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

A. zero matrix

B. row matrix

C. unit matrix

D. column matrix

Answer: A

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20. The sum of $\begin{bmatrix} 2 & -3 \\ 5 & -7 \end{bmatrix}$ and its multiplicative inverse is

A. $\begin{bmatrix} -5 & 0 \\ 0 & -5 \end{bmatrix}$

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

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

D. $\begin{bmatrix} 0 & +2 \\ -2 & 0 \end{bmatrix}$

Answer: A

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

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

B. $|A|$

C. $|B|$

D. None of these

Answer: B

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

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

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

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

D. None of these

Answer: B

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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. 0

B. $A^2 + B^2$

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

D. $A + B$

Answer: B

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24. If A is a non -singular matrix such that $A^3 = A + l$, then the inverse of $B = A^6 - A^5$ is

A. A

B. A^{-1}

C. $-A$

D. $-A^{-1}$

Answer: B

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25. If A is a skew symmetric matrix of order n and C is a column matrix of order $n \times 1$, then $C^T AC$ is

A. an identity matrix of ordern

B. an identity of order 1

C. a zero matrix of order 1

D. None of the above

Answer: C

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26. If A and B are two square matrices such that $AB = A$ and $BA = B$, then A^2 equals

A. B

B. A

C. I

D. O

Answer: B

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27. Matrix A such that $A^2 = 2A - I, whereI$ is the identity matrix, the for $n \geq 2$. A^n is equal to $2^{n-1}A - (n-1)l$ b. $2^{n-1}A - I$ c. $nA - (n-1)l$ d. $nA - I$

A. $nA - (n-1)l$

B. $nA - l$

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

D. $2^{n-1}A - l$

Answer: A

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28. If A is a non-singular matrix of order 3, then adj(adj(A)) is equal to

A. A

B. A^{-1}

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

D. $|A|A$

Answer: D

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29. 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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30. 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. 0

C. 5

D. 4

Answer: C

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31. If $A(\theta) = \begin{bmatrix} 1 & than\theta \\ -\tan & \theta = 1 \end{bmatrix}$ and $AB = l$, then $\left(\sec^2\theta\right)B$ is equal to

A. $A(\theta)$

B. $A\left(\frac{\theta}{2}\right)$

C. $A(-\theta)$

D. $A\left(-\frac{\theta}{2}\right)$

Answer: C

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32. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then A^{-1} is

A. A

B. $-A$

C. $adj(A)$

D. $-adj(A)$

Answer: C

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33. Suppose A is a matrix of order 3 and $B = |A|A^{-1}$. If $|A| = 5$, then $|B|$ is equal to

A. 1

B. -5

C. -1

D. 25

Answer: D

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

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

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

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

Answer: A

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35. If $f(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then $\left\{ f(\theta)^{-1} \right\}$ is equal to

A. $f(-\theta)$

B. $f(\theta)^{-1}$

C. $f(2\theta)$

D. None of these

Answer: A

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36. If A is a singular matrix, then $Aadj(A)$ is a/an

A. scalar matrix

B. zero matrix

C. identity matrix

D. orthogonal matrix

Answer: B

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37. If k is a scalar and l is a unit matrix of order 3 then $adj(kl)$ is equal to

A. $k^3 I$

B. $k^2 I$

C. $-k^3 I$

D. $-k^2 I$

Answer: B

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38. Consider the system of equations

$x + y + z = 6$

$x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

the system has unique solution if

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

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

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

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

Answer: D

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39. Let a, b, c be any real numbers. Suppose that there are real numbers x, y, z not all zero such that $x = cy + bz, y = az + cxandz = bx + ay$. Then $a^2 + b^2 + c^2 + 2abc$ is equal to (1) 2 (2) 1 (3) 0 (4) 1

A. 1

B. 2

C. -1

D. 0

Answer: A

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40. 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. infinite solutions

B. unique solution

C. no solution

D. finite number of solutions.

Answer: B

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41. If the system of linear equations $x + 2ay + az = 0, x + 3by + bz = 0$ and $x + 4cy + cz = 0$ has a non-zero solution, then a, b, c

A. are in AP

B. are in GP

C. are in HP

D. satisfy $a + 2b + 3c = 0$

Answer: C

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42. The symmetric part of the matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 6 & 8 & 2 \\ 2 & -2 & 7 \end{bmatrix}$ is equal to

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

B. $\begin{bmatrix} 1 & 4 & 3 \\ 2 & 8 & 0 \\ 3 & 0 & 7 \end{bmatrix}$

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

D. $\begin{bmatrix} 1 & 4 & 3 \\ 4 & 8 & 3 \\ 3 & 0 & 7 \end{bmatrix}$

Answer: D

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

A. 0

B. $-A$

C. l

D. $2A$

Answer: C

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44. If $A = [12221 - 2a2b]$ is a matrix satisfying the equation $\forall^T = 9I$, where I is 3×3 identity matrix, then the ordered pair (a, b) is equal to :

(1) $(2, -1)$ (2) $(-2, 1)$ (3) (2, 1) (4) $(-2, -1)$

A. $(2, -1)$

B. $(-2, 1)$

C. $(2, 1)$

D. $(-2, -1)$

Answer: D

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45. If A is a 3×3 such that $|5.\ adj(A)| = 5$ then $|A|$ is equal to

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

B. $\pm \frac{1}{25}$

C. ± 1

D. ± 5

Answer: A

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46. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $\left|A^3\right| = 27$ then α is equal to

A. $\pm\sqrt{7}$

B. ± 1

C. $\pm\sqrt{5}$

D. ± 2

Answer: A

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47. The elements 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. 7

D. 1

Answer: C

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48. If $A = \begin{bmatrix} -1 & 3 \\ 2 & 1 \end{bmatrix}$ then $1 + A + A^2 + \ldots\ldots\ldots\ldots + \infty$ is equal to

A. $-\frac{1}{6}\begin{bmatrix} 0 & 3 \\ 2 & 2 \end{bmatrix}$

B. $\frac{1}{6}\begin{bmatrix} 0 & 3 \\ 2 & 2 \end{bmatrix}$

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

D. None of these

Answer: A

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49. if $A = \begin{bmatrix} 1 & -2 \\ 4 & 5 \end{bmatrix}$ and $f(t) = t^2 - 3t + 7$ then $f(A) + \begin{bmatrix} 3 & 6 \\ -12 & -9 \end{bmatrix} =$

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

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

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

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

Answer: B

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1. If $A = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 1 & 5 \\ 1 & 2 & 1 \end{bmatrix}$ then $a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23}$ is equal to

A. 1

B. 0

C. -1

D. 2

Answer: B

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2. If $A = \begin{bmatrix} 2 & 2 \\ -3 & 2 \end{bmatrix}, B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ then $\left(B^{-1}A^{-1}\right)^{-1}$ is equal to

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

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

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

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

Answer: A

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3. If matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$, such that $AX = I$, then X is equal to

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

B. $\frac{1}{5}\begin{bmatrix} 4 & 2 \\ 4 & -1 \end{bmatrix}$

C. $\frac{1}{5}\begin{bmatrix} -3 & 2 \\ 4 & -1 \end{bmatrix}$

D. $\frac{1}{5}\begin{bmatrix} -1 & 2 \\ -1 & 4 \end{bmatrix}$

Answer: C

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4. The multiplicative inverse of $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is

A. $\begin{bmatrix} -\cos\theta & \sin\theta \\ -\sin\theta & -\cos\theta \end{bmatrix}$

B. $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

C. $\begin{bmatrix} -\cos\theta & -\sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$

D. $\begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$

Answer: B

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5. The value of a for which system of equation , $a^3x + (a+1)^3y + (a+2)^3z = 0, ax + (a+1)y + (a+2)z = 0, x + y +$ has a non-zero solution is:

A. 1

B. 0

C. -1

D. None of these

Answer: C

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6. Let $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ -\sin\theta & -\cos\theta \end{bmatrix}$ then the inverse of a is

A. $\begin{bmatrix} \cos\theta & -\sin\theta \\ -\sin\theta & -\cos\theta \end{bmatrix}$

B. $\begin{bmatrix} -\cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

C. $\begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & -\sin\theta \end{bmatrix}$

D. $\begin{bmatrix} -\sin\theta & -\cos\theta \\ -\cos\theta & \sin\theta \end{bmatrix}$

Answer: A

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7. If matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $|A|^{-1}$ is equal to

A. $ad - bc$

B. $\frac{1}{ad - bc}$

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

D. None of the above

Answer: B

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8. If $A = \begin{bmatrix} 3 & 2 & 4 \\ 1 & 2 & 1 \\ 3 & 2 & 6 \end{bmatrix}$ and A_{ij} are the cofactors of a_{ij}, then $a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13}$ is equal to

A. 8

B. 6

C. 4

D. 0

Answer: A

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9. $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ and $AB = BA = I$, then B is equal to

A. $\begin{bmatrix} -\cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

B. $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

C. $\begin{bmatrix} -\sin\theta & \cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$

D. $\begin{bmatrix} \sin\theta & -\cos\theta \\ -\cos\theta & \sin\theta \end{bmatrix}$

Answer: B

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10. The inverse matrix of $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ is

A. $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & -1 \\ \frac{5}{2} & -\frac{3}{2} & \frac{1}{2} \end{bmatrix}$

B. $\begin{bmatrix} \frac{1}{2} & -4 & \frac{5}{4} \\ 1 & -6 & 3 \\ 1 & 2 & -1 \end{bmatrix}$

C. $\frac{1}{2}\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 4 & 2 & 3 \end{bmatrix}$

D. $\frac{1}{2}\begin{bmatrix} 1 & -1 & -1 \\ -8 & 6 & -2 \\ 5 & -3 & 1 \end{bmatrix}$

Answer: A

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11. The solutiion of (x, y, z) the equation $\begin{bmatrix} -1 & 0 & 1 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$ is (x, y, z)

A. $(1, 1, 1)$

B. $(0, -1, 2)$

C. $(-1, 2, 2)$

D. $(-1, 0, 2)$

Answer: D

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12. 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 solutions

C. there is no solution

D. None of the above

Answer: A

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13. 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 the product AB is null matrix, then $\alpha - \beta$ is

A. 0

B. multiple of π

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

D. None of the above

Answer: C

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14. If $A(\alpha) = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then the matrix $A^2(\alpha)$ is

A. $A(2\alpha)$

B. $A(\alpha)$

C. $A(3\alpha)$

D. $A(4\alpha)$

Answer: A

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15. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & a \\ 4 & b \end{bmatrix}$ and $(A+B)^2 = A^2 + B^2$.

Then a and b are respectively

A. $1, -1$

B. $2, -3$

C. $-1, 1$

D. $3, -2$

Answer: A

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16. If $A + I = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$ then $(A + I)(A - I)$ is equal to

A. $\begin{bmatrix} -5 & -4 \\ 8 & -9 \end{bmatrix}$

B. $\begin{bmatrix} -5 & 4 \\ -8 & 9 \end{bmatrix}$

C. $\begin{bmatrix} 5 & 4 \\ 8 & 9 \end{bmatrix}$

D. $\begin{bmatrix} -5 & -4 \\ -8 & -9 \end{bmatrix}$

Answer: A

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17. If $A = [x \quad y \quad z], B = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ and $C = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

Then $ABC = O$ if

A. $[ax^2 + by^2 + cz^2 + 2gxy + 2fyz + 2czx] = O$

B. $[ax^2 + cy^2 + bz^2 + xy + yz + zx] = O$

C. $[ax^2 + by^2 + cz^2 + 2hxy + 2by + 2cz] = O$

D. $[ax^2 + by^2 + cz^2 + 2gzx + 2hxy + 2fyz] = O$

Answer: D

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18. If $A = \begin{bmatrix} -2 & 4 \\ -1 & 2 \end{bmatrix}$ then A^2 is equal to

A. null matrix

B. unit matrix

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

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

Answer: A

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