MATHS

BOOKS - NDA PREVIOUS YEARS

MATRICES & DETERMINANTS

Mqs

1. $A_{(\alpha)} = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}, A_{(\beta)} = \begin{bmatrix} \cos\beta & -\sin\beta \\ \sin\beta & \cos\beta \end{bmatrix}$

Which one of the following is correct ?

A. $A_{(-\alpha)} A_{(-\beta)} = A_{(\alpha+\beta)}$

B. $A_{(-\alpha)} A_{(\beta)} = A_{(\alpha-\beta)}$

C. $A_{(\alpha)} A_{(-\beta)} = A_{\{-(\beta-\alpha)\}}$

D. $A_{(\alpha)} A_{(\beta)} = A_{(\alpha+\beta)}$

Answer: D

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2. If $f(x)=\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$ then the maximum value of f(x) is

A. 2

B. 4

C. 6

D. 8

Answer: C

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3. If the matrix $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is singular, then what is one of the values of θ?

A. $\frac{\pi}{4}$

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

C. π

D. 0

Answer: A

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4. For what values of k, does the system of linear equations $x + y + z = 2, 2x + y - z = 3, 3x + 2y + kz = 4$ have a unique solution ?

A. k = 0

B. $-1 < k < 1$

C. $-2 < k < 2$

D. $k \neq 0$

Answer: D

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5. Let A = $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & x \\ 0 & 1 \end{bmatrix}$ If AB = BA, then what is the value of x ?

A. -1

B. 0

C. 1

D. Any real number

Answer: B

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6. If a matrix B is obtained from a square matrix A by interchanging any two of its rows, then what is |A+B| equal to

A. $2|A|$

B. $2|B|$

C. 0

D. $|A| - |B|$

Answer: C

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7. Let $A = (a_{ij})_{n \times n}$ and adj A = (α_{ij})

If A = $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 4 \\ 2 & 3 & -1 \end{bmatrix}$, what is the value of α_{23} ?

A. 1

B. -1

C. 8

D. -8

Answer: C

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8. If A and B are non-singular square matrices of same order then $adj(AB)$ is equal to

A. (adj A) (adj B)

B. (adj A) + (adj B)

C. (adj A) - (adj B)

D. (adj B) (adj A)

Answer: D

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9. M is a matrix with real entries given by $M = \begin{bmatrix} 4 & k & 0 \\ 6 & 3 & 0 \\ 2 & t & k \end{bmatrix}$

Which of the following conditions guarantee the invertivility of M ?

1. $k \neq 2$

2. $k \neq 0$

3. $t \neq 0$

4. $t \neq 1$

Select the correct answer using the code given below :

A. 1 and 2

B. 2 and 3

C. 1 and 4

D. 3 and 4

Answer: A

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10. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ be a square matrix of order 3. Then for any positive integer n, what is A^n equal to ?

A. A

B. $3^n A$

C. $\left(3^{n-1}\right) A$

D. 3A

Answer: C

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

A. A = 0 or B = 0

B. A = 0 and B = 0

C. A and B are non-zero square matrices

D. A and B cannot both be non-singular

Answer: C

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12. If A is a matrix of order p $\times$ q and B is a matrix of order s $\times$ t, under which one of the following conditions does AB exist ?

A. p = t

B. p = s

C. q = t

D. q = s

Answer: D

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13. If A is a square matrix such that $A - A^T = 0$, then which one of the following is correct ?

A. A must be a null matrix

B. A must be a unit matrix

C. A must be a scalar matrix

D. None of the above

Answer: D

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14. The largest value of a third order determinant whose elements are equal to $1 \text{ or } 0$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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15. What is the inverse of $A = \begin{bmatrix} 1+i & 1+i \\ -1+i & 1-i \end{bmatrix}$?

A. $\frac{1}{4}\begin{bmatrix} 1-i & -1-i \\ 1-i & 1+i \end{bmatrix}$

B. $\frac{1}{4}\begin{bmatrix} 1+i & -1+i \\ 1+i & -1-i \end{bmatrix}$

C. $\frac{1}{4}\begin{bmatrix} 1+i & 1-i \\ -1-i & 1+i \end{bmatrix}$

D. $\frac{1}{4}\begin{bmatrix} 1+i & 1-i \\ -1-i & -1+i \end{bmatrix}$

Answer: A

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16. In respect of the equation $\begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ c-5 \end{bmatrix}$

correctly match List I with List II and select the correct answer using the code given below the lists :

	List I (Value of c))	List II (Nature of the Equation)
$A.$	5	1. The equation has no solution.
$B.$	10	2. The equation has a unique solution.
$C.$	15	3. The equation has an infinite set of solution.
		4. The equation has two infinite sets of independent solution

A. $\begin{matrix} A & B & C \\ 4 & 2 & 3 \end{matrix}$

B. $\begin{matrix} A & B & C \\ 1 & 1 & 3 \end{matrix}$

C. $\begin{matrix} A & B & C \\ 2 & 2 & 4 \end{matrix}$

D. $\begin{matrix} A & B & C \\ 4 & 1 & 3 \end{matrix}$

Answer: B

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17. If $A^{-1} = \begin{bmatrix} 1 & -2 \\ -2 & 2 \end{bmatrix}$, what is det (A) ?

A. 2

B. -2

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

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

Answer: D

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18. From the matrix equation AB = AC, which one of the following can be concluded ?

A. B = C for any matrix A

B. B = C, if A is singular

C. B = C, if A is non-singular

D. A = B = C for any matrix A

Answer: C

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19. What is the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ if $a^3 + b^3 + c^3 = 0$?

A. 0

B. 1

C. 3 abc

D. $-3abc$

Answer: C

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20. If $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ is a 2×2 matrix and f(x) = $x^2 - x + 2$ is a polynomial, then what is f (A) ?

A. $\begin{bmatrix} 1 & 7 \\ 1 & 7 \end{bmatrix}$

B. $\begin{bmatrix} 2 & 6 \\ 0 & 8 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 6 \\ 0 & 6 \end{bmatrix}$

D. $\begin{bmatrix} 2 & 6 \\ 0 & 7 \end{bmatrix}$

Answer: B

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21. If A is a non-null row matrix with 5 columns and B is a non-null column matrix with 5 rows, how many rows are there in A $\times$ B ?

A. 1

B. 5

C. 10

D. 25

Answer: A

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22. Assertion (A) : If A = $\begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}, B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then $(A+B)^2 = A^2 + B^2 + 2AB.$

Reason (R) : In the above AB = BA

A. Both A and R are individually true and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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23. Assertion (A) : If $A = \begin{pmatrix} \cos\alpha & \sin\alpha \\ \cos\alpha & \sin\alpha \end{pmatrix}$ and $B = \begin{pmatrix} \cos\alpha & \cos\alpha \\ \sin\alpha & \sin\alpha \end{pmatrix}$, then $AB \neq 1$.

Reason (R) : The product of two matrices can never be equal to an identity matrix.

A. Both A and R are individually true and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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24. If A is any 2 $\times$ matrix such that $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} A = \begin{bmatrix} -1 & 0 \\ 6 & 3 \end{bmatrix}$ then what is A equal to ?

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

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

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

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

Answer: C

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25. If A is a 3 $\times$ 3 matrix such that |A| = 4, then what is A(adj A) equal to ?

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

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

C. $\begin{bmatrix} 16 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 16 \end{bmatrix}$

D. Cannot be determined, as data is insufficient.

Answer: B

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26. $\begin{bmatrix} x & x^2 & 1+x^2 \\ y & y^2 & 1+y^2 \\ z & z^2 & 1+z^2 \end{bmatrix}$ where x,y,z are distinct. What is |A|.

A. 0

B. $x^2y - y^2x + xyz$

C. $(x-y)(y-z)(z-x)$

D. xyz

Answer: C

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27. Under which of the following condition(s), will the matrix $A = \begin{bmatrix} 0 & 0 & q \\ 2 & 5 & 1 \\ 8 & p & p \end{bmatrix}$ be singular ?

1. q = 0 2. p = 0 3. p = 20

Select the correct answer using the code given below :

A. 1 and 2

B. 3 only

C. 1 and 3

D. 1 or 3

Answer: D

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28. Consider the following statements :

1. If det A = 0, then det (adj A) = 0

2. If A is non-singular, the $\det\left(A^{-1}\right) = (\det A)^{-1}$

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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29. Let A be an m $\times$ n matrix. Under which one of the following conditions does A^{-1} exist ?

A. m = n only

B. m = n and det A $\neq$ 0

C. m = n and det A = 0

D. m $\neq$ n

Answer: B

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30. Let A and B be two matrices of order n $\times$ n. Let A be non-singular and B be singular. Consider the following :

1. AB is singular

2. AB is non-singular

3. A^{-1} B is singular

4. A^{-1} B is non singular

Which of the above is/are correct ?

A. 1 and 3

B. 2 and 4 only

C. 1 only

D. 3 only

Answer: B

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31. Let A be a square matrix of order n $\times$ n where n $\geq$ 2. Let B be a matrix obtained from A with first and second rows interchanged. Then which one of the following is correct ?

A. det A = det B

B. det A = -det B

C. A = B

D. A = -B

Answer: B

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32. What should be the value of k so that the system of linear equations $x - y + 2z = 0, kx - y + z = 0, 3x + y - 3z = 0$ does not possess a unique solution ?

A. 0

B. 3

C. 4

D. 5

Answer: D

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33. The matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$ satisfies which one of the following polynomial equations ?

A. $A^2 + 3A + 2I = 0$

B. $A^2 + 3A - 2I = 0$

C. $A^2 - 3A - 2I = 0$

D. $A^2 - 3A + 2I = 0$

Answer: C

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34. The number of values of k for which the system of the equations $(k+1)x+8y=4kandkx+(k+3)y=3k-1$ has infinitely many solutions is 0 b. 1 c. 2 d. infinite

A. 1

B. 2

C. 3

D. None of the above

Answer: C

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35. For what value of p, is the system of equation $p^3x+(p+1)^3y=(p+2)^3$and $px+(p+1)y=(p+2)$ and $x+y=1$ inconsistent

A. $p = 0$

B. $p = 1$

C. $p = -1$

D. For all $p > 1$

Answer: C

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36. If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, then what is the value of x ?

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

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

C. 1

D. 2

Answer: B

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

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

B. $|A|^{m}$

C. $|A|^{m+1}$

D. Zero

Answer: C

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38. If ω is the cube root of unity, then what is one root of the equation $\begin{vmatrix} x^2 & -2x & -2\omega^2 \\ 2 & \omega & -\omega \\ 0 & \omega & 1 \end{vmatrix} = 0$?

A. 1

B. -2

C. 2

D. ω

Answer: B

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39. If $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$, then what is A^n equal to ?

A. $\begin{bmatrix} 2^n & 2^n \\ 2^n & 2^n \end{bmatrix}$

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

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

D. $\begin{bmatrix} 2^{2n+1} & 2^{2n+1} \\ 2^{2n+1} & 2^{2n+1} \end{bmatrix}$

Answer: C

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40. If the least number of zeroes in a lower triangular matrix is 10, then what is the order of the matrix ?

A. 3×3

B. 4×4

C. 5×5

D. 10×10

Answer: B

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41. If the inverse of $\begin{bmatrix} 1 & p & q \\ 0 & x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is $\begin{bmatrix} 1 & -p & -q \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then what is the value of x?

A. 1

B. Zero

C. -1

D. $\frac{1}{p}+\frac{1}{q}$

Answer: A

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42. If $AB=\begin{bmatrix}4 & 11\\ 4 & 5\end{bmatrix}$ and $A=\begin{bmatrix}3 & 2\\ 1 & 2\end{bmatrix}$, then what is the value of the determinant of the matrix B ?

A. 4

B. -6

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

D. -28

Answer: B

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43. The determinant $\begin{vmatrix} a+b+c & a+b & a \\ 4a+3b+2c & 3a+2b & 2a \\ 10a+6b+3c & 6a+3b & 3a \end{vmatrix}$ is independent of which one of the following ?

A. a and b

B. b and c

C. a and c

D. All of these

Answer: B

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44. If $X = \begin{bmatrix} 1 & -2 \\ 0 & 3 \end{bmatrix}$, and I is a 2×2 identity matrix, then $X^2 - 2X + 3I$ equals to which one of the following ?

A. $-I$

B. $-2X$

C. $2X$

D. $4X$

Answer: C

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45. If the matrix B is the adjoint of the square matrix A and α is the value of the determinant of A, then what is AB equal to ?

A. α

B. $\left(\frac{1}{\alpha}\right)I$

C. I

D. αI

Answer: D

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46. What is the determinant $\begin{vmatrix} bc & a & a^2 \\ ca & b & b^2 \\ ab & c & c^2 \end{vmatrix}$ equal to ?

A. $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$

B. $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$

C. $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$

D. $\begin{vmatrix} a & a^2 & a^3 \\ b & b^2 & b^3 \\ c & c^2 & c^3 \end{vmatrix}$

Answer: B

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47. If $x^2 + y^2 + z^2 = 1$, then what is the value of $\begin{vmatrix} 1 & z & -y \\ -z & 1 & x \\ y & -x & 1 \end{vmatrix} = ?$

A. 0

B. 1

C. 2

D. 2-2 xyz

Answer: C

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48. If $|A_{n\times n}| = 3$ and $|\text{adj A}| = 243$, what is the value of n?

A. 4

B. 5

C. 6

D. 7

Answer: C

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49. Under what condition does A (BC) = (AB)C hold, where A, B, C are three matrices ?

A. AB and BC both must exist

B. Only Ab must exist

C. Only BC must exist

D. Always true

Answer: A

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50. If A is matrix of order 3×2 and B is matrix of order 2×3, then what is |kAB|equal to (where k is any scalar quantity)?

A. $k|AB|$

B. $k^2|AB|$

C. $k^3|AB|$

D. |AB|

Answer: C

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51. If $\begin{bmatrix} 5 & 0 \\ 0 & 7 \end{bmatrix}^{-1} \begin{bmatrix} x \\ -y \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$, then which one of the following is correct ?

A. x = 5, y = 14

B. x = -5, y = 15

C. x = -5, y = -14

D. x = 5, y = -14

Answer: C

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52. Which one of the following statement is correct ? The system of linear equations, $2x + 3y = 4$ and $4x + 6y = 7$, has

A. no solution

B. a unique solution

C. exactly 3 solutions

D. an infinite number of solutions

Answer: A

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53. Suppose the system of equations

$a_1x + b_1y + c_1z = d_1$

$a_2x + b_2y + c_2z = d_2$

$a_3x + b_3y + c_3z = d_3$

has a unique solution (x_0, y_0, z_0). If $x_0 = 0$, then which one of the following is correct ?

A. $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$

B. $\begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix} = 0$

C. $\begin{vmatrix} d_1 & a_1 & c_1 \\ d_2 & a_2 & c_2 \\ d_3 & a_3 & c_3 \end{vmatrix} = 0$

D. $\begin{vmatrix} d_1 & a_1 & b_1 \\ d_2 & a_2 & b_2 \\ d_3 & a_3 & b_3 \end{vmatrix} = 0$

Answer: B

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54. If a,b,c are in G.P. then the value of $\begin{vmatrix} a & b & a+b \\ b & c & b+c \\ a+b & b+c & 0 \end{vmatrix} =$ (A) 1 (B) -1 (C) $a+b+c$ (D) 0

A. 0

B. 1

C. -1

D. None of these

Answer: A

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55. If adj A = $\begin{bmatrix} a & 0 \\ -1 & b \end{bmatrix}$ and ab $\neq$ 0, then what is the value of $\left|A^{-1}\right|$?

A. 1

B. ab

C. $1/\sqrt{ab}$

D. $1/ab$

Answer: A

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56. If l + m + n = 0, then the system of equations

$$-2x + y + z = l$$

$$x - 2y + z = m$$

$$x + y - 2z = n$$

has

A. a trivial solution

B. no solution

C. a unique solution

D. infinitely many solutions

Answer: D

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57. If

$$(a_1/x) + (b_1/y) = c_1, (a_2/x) + (b_2/y) = c_2 \Delta_1 = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}, \Delta_2 = \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix}$$

, then (x, y) is equal to which one of the following ?

A. $(\Delta_2/\Delta_1, \Delta_3/\Delta_1)$

B. $(\Delta_3/\Delta_1, \Delta_2/\Delta_1)$

C. $(-\Delta_1/\Delta_2, -\Delta_1/\Delta_3)$

D. $(-\Delta_1/\Delta_2, -\Delta_1/\Delta_3)$

Answer: C

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58. Show that $\begin{vmatrix} \sin 10^\circ & -\cos 10^\circ \\ \sin 80^\circ & \cos 80^\circ \end{vmatrix} = 1.$

A. 0

B. 1

C. -1

D. $1/2$

Answer: B

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59. If $\begin{vmatrix} 2 & 4 & 0 \\ 0 & 5 & 16 \\ 0 & 0 & 1+p \end{vmatrix} = 20$, then what is the value of p?

A. 0

B. 1

C. 2

D. 5

Answer: B

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

A. $\left(A^T\right)^2 = A^T$

B. $\left(A^T\right)^2 = B^T$

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

D. None of the above

Answer: A

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61. If $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$, then what is the matrix A ?

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

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

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

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

Answer: D

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62. Under which one of the following condition does the system of equations

$kx + y + z = k - 1$

$x + ky + z = k - 1$

$x + y + kz = k - 1$

have no solution ?

A. k = 1

B. k $\neq$ -2

C. k = 1 or k = -2

D. k = -2

Answer: C

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63. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ where a, b are natural numbers, then which one of the following is correct ?

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 exist infinitely many B's such that AB = BA

D. There cannot exist any B such that AB = BA

Answer: C

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64. Consider a matrix $M = \begin{bmatrix} 3 & 4 & 0 \\ 2 & 1 & 0 \\ 3 & 1 & k \end{bmatrix}$ and the following statements

Statement A : Inverse of M exists.

Statement B : k $\neq$ 0

Which one of the following in respect of the above matrix and statement is correct ?

A. A implies B, but B does not imply A

B. B implies A, but does not imply B

C. Neither A implies B nor B implies A

D. A implies B as well as B implies A

Answer: D

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65. If $\begin{vmatrix} y & x & y+z \\ z & y & x+y \\ x & z & z+x \end{vmatrix} = 0$, then which one of the following is correct ?

A. Either x + y = z or x = y

B. Either x + y = - z or x = z

C. Either x + z = y or z = y

D. Either z + y = x or x = y

Answer: B

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66. What is the value of k, if $\begin{vmatrix} k & b+c & b^2+c^2 \\ k & c+a & c^2+a^2 \\ k & a+b & a^2+b^2 \end{vmatrix} = (a-b)(b-c)(c-a)$?

A. 1

B. -1

C. 2

D. 0

Answer: A

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67. Let $A = \begin{bmatrix} 0 & 0 & -10 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ 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. $A = (-1)I$

C. A is a unit matrix

D. $A^2 = I$

Answer: D

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68. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$, then what is A (adj A) equal to ?

A. $\begin{bmatrix} 0 & 10 \\ 10 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$

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

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

Answer: B

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69. What is the inverse of $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$?

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

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

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

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

Answer: B

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70. Consider the following statements in respect of symmetric matrices A and B

1. AB is symmetric.

2. $A^2 + B^2$ is symmetric.

Which of the above statement(s) is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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71. The following item consists of two statements, one labelled the Assertion (A) and the other labelled the Reason (R). You are to examine these two statements carefully and decide if the Assertion (A) and Reason (R) are individually true and if so, whether the reason is a correct explanation of the Assertion. Select your answer using the codes given below :

Assertion (A) : $M = \begin{bmatrix} 5 & 10 \\ 4 & 8 \end{bmatrix}$ is invertible.

Reason (R) : M is singular.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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72. If X and Y are the matrices of order 2×2 each and $2X - 3Y = \begin{bmatrix} -7 & 0 \\ 7 & -13 \end{bmatrix}$ and $3X + 2Y = \begin{bmatrix} 9 & 13 \\ 4 & 13 \end{bmatrix}$, then what is Y equal to ?

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

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

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

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

Answer: C

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73. If a, b and c are all non-zero and $|1+a111a+b111a+c|=0,$ then prove that $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+1=0$

A. 2

B. 1

C. -1

D. 0

Answer: C

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74. If a matrix A is symmetric as well as anti-symmetric, then which one of the following is correct ?

A. A is a diagonal matrix

B. A is a null matrix

C. A is a unit matrix

D. A is a triangular matrix

Answer: B

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75. If $A = \begin{bmatrix} 1 & -2 & -3 \\ 2 & 1 & -2 \\ 3 & 2 & 1 \end{bmatrix}$, then which one of the following is correct ?

A. A is symmetric matrix

B. A is anti-symmetric matrix

C. A is singular matrix

D. A is non-singular matrix

Answer: D

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76. $A = \begin{vmatrix} 2a & 3r & x \\ 4b & 6s & 2y \\ -2c & -3t & -z \end{vmatrix} = \lambda \begin{vmatrix} a & r & x \\ b & s & y \\ c & t & z \end{vmatrix}$, then what is the value of λ ?

A. 12

B. -12

C. 7

D. -7

Answer: B

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77. What is the value of $\begin{vmatrix} 1-i & \omega^2 & -\omega \\ \omega^2+i & \omega & -i \\ 1-2i-\omega^2 & \omega^2-\omega & i-\omega \end{vmatrix}$, where ω is the cube root of unity ?

A. -1

B. 1

C. 2

D. 0

Answer: D

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78. 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. Null matrix

D. Identity matrix

Answer: A

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79. A matrix X has $a+b$ rows and $a+2$ columns while the matrix Y has $b+1$ rows and $a+3$ columns. Both matrices XY and YX exist. Find a and b. Can you say XY and YX are of the same type? Are they equal.

A. 3, 2

B. 2, 3

C. 2, 4

D. 4, 3

Answer: B

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80. If $\begin{vmatrix} a & b & c \\ l & m & n \\ p & q & r \end{vmatrix} = 2$, then what is the value of the determinant $\begin{vmatrix} 6a & 3b & 15c \\ 2l & m & 5n \\ 2p & q & 5r \end{vmatrix}$?

A. 10

B. 20

C. 40

D. 60

Answer: D

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81. Let $A = \begin{bmatrix} 5 & 6 & 1 \\ 2 & -1 & 5 \end{bmatrix}$. Let there exist a matrix B such that $AB = \begin{bmatrix} 35 & 49 \\ 29 & 13 \end{bmatrix}$. What is B equal to ?

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

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

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

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

Answer: C

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82. Consider the following statements

1. If A' = A, then A is a singular matrix, where A' is the transpose of A.

2. If A is a square matrix such that $A^3 = I$, then A is non-singular.

Which of the statements guven above is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

Watch Video Solution

83. If the system of equations $2x + 3y = 7$ and $2ax + (a + b)y = 28$ has infinitely many solutions, then which one of the following is correct ?

A. a = 2b

B. b = 2a

C. a = -2b

D. b = -2a

Answer: B

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84. If the lines $3y + 4x = 1, y = x + 5$ and $5y + bx = 3$ are concurrent then $b =$

A. 1

B. 3

C. 6

D. 0

Answer: C

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85. What is the value of $\begin{vmatrix} \cos 15^\circ, \sin 15^\circ \\ \cos 45^\circ, \sin 45^\circ \end{vmatrix} \times \begin{vmatrix} \cos 45^\circ, \cos 15^\circ \\ \sin 45^\circ, \sin 15^\circ \end{vmatrix}$?

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

B. $\frac{\sqrt{3}}{2}$

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

D. $-\frac{3}{4}$

Answer: C

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86. Let A be an n $\times$ n matrix. If det $(\lambda A) = \lambda^s$ det(A), what is the value of s?

A. 0

B. 1

C. -1

D. n

Answer: D

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87. If A be a real skew-symmetric matrix of order n such that $A^2 + I = 0$, I being the identity matrix of the same order as that of A, then what is the order of A?

A. Any natural number

B. Odd

C. Prime number

D. Even

Answer:

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88. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = [a_{ij}]$, where i, j = 1, 2, If its inverse matrix is $[b_{ij}]$, what is b_{22} ?

A. -2

B. 1

C. $\frac{3}{2}$

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

Answer: D

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89. If $\begin{bmatrix} 1 & -3 & 2 \\ 2 & -8 & 5 \\ 4 & 2 & \lambda \end{bmatrix}$ is not an invertible matrix, then what is the value of λ ?

A. -1

B. 0

C. 1

D. 2

Answer: C

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90. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}, B = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}, C = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$, then which one of the following in not correct ?

A. $A^2 = B^2$

B. $B^2 = C^2$

C. AB = C

D. AB = BA

Answer: D

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91. If $x + iy = \begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$, then what is x - iy equal to ?

A. 3 + i

B. 1 + 3i

C. 3i

D. 0

Answer: D

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92. If |A| = 8, where A is square matrix of order 3, then what is |adj A| equal to ?

A. 16

B. 24

C. 64

D. 512

Answer: C

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93. Consider the following statements in respect of a square matrix A and its transpose A^T.

1. $A + A^T$ is always symmetric.

2. $A - A^T$ is always anti-symmetric

Which of the statements given above is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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

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

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

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

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

Answer: A

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

A. A = 0 and B = 0

B. |A| = 0 and |B| = 0

C. Either |A| = 0 or |B| = 0

D. Either A = 0 or B = 0

Answer: D

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96. If A is a square matrix, then what is adj $A^T - (adjA)^T$ equal to ?

A. 2|A|

B. 2|A|I

C. Null Matrix

D. Unit Matrix

Answer: C

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97. What is the value of $\begin{vmatrix} 1 & \omega & 2\omega^2 \\ 2 & 2\omega^2 & 4\omega^3 \\ 3 & 3\omega^3 & 6\omega^4 \end{vmatrix}$, where ω is the cube root of unity ?

A. 0

B. 1

C. 2

D. 3

Answer: A

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98. If the matrix $A = \begin{bmatrix} 2-x & 1 & 1 \\ 1 & 3-x & 0 \\ -1 & -3 & -x \end{bmatrix}$ is singular, then what is the solution set S ?

A. S = {0, 2, 3}

B. S = {-1, 2, 3}

C. S = {1, 2, 3}

D. S = {2, 3}

Answer: A

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99. Consider the following statements.

I. The inverse of a square matrix, if it exists, is unique.

II. If A and B are singular matrices of order n, then AB is also a singular matrix of order n.

Which of the statements given above is/are correct ?

A. Only I

B. Only II

C. Both I and II

D. Neither I nor II

Answer: A

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100. What is the value of the determinant $\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$?

A. x + 2

B. $x^2 + 2$

C. 2

D. -2

Answer: D

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101. If 5 and 7 are the roots of the equation $\begin{vmatrix} x & 4 & 5 \\ 7 & x & 7 \\ 5 & 8 & x \end{vmatrix} = 0$, then what is the third root ?

A. -12

B. 9

C. 13

D. 14

Answer: A

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102. Find the value of k in which the system of equations $kx + 2y = 5$ and $3x + y = 1$ has no solution ?

A. 0

B. 3

C. 6

D. 15

Answer: C

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103. If the matrix $A = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ is such that $A^2 = I$, then which one of the following is correct ?

A. $\alpha = 0, \beta = 1$ or $\alpha = 1, \beta = 0$

B. $\alpha = 0, \beta \neq 1$ or $\alpha \neq 1, \beta = 1$

C. `alpha = 1, beta ne 0 or alpha ne 1, beta = 1

D. $\alpha \neq 0, \beta \neq 0$

Answer: A

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104. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ such that $A^2 = B$, then what is the value of α ?

A. -1

B. 1

C. 2

D. 4

Answer: B

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105. $A = \begin{bmatrix} 3 & 1 \\ 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix}$, then which of the following is/are correct ?

I. AB is defined

II. BA is defined

III. AB = BA

Select the correct answer using the codes given below.

A. Only I

B. Only II

C. Both I and II

D. I, II and III

Answer: D

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106. The simultaneous equations $3x + 5y = 7$ and $6x + 10y = 18$ have

A. no solution

B. infinitely many solutions

C. unique solution

D. any finite number of solutions

Answer: A

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107. The roots of the equation $\begin{vmatrix} x & \alpha & 1 \\ \beta & x & 1 \\ \beta & \gamma & 1 \end{vmatrix} = 0$ are independent of

A. α

B. β

C. γ

D. α, β and γ

Answer: A

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108. What is the value of the determinant $\begin{vmatrix} a-b & b+c & a \\ b-c & c+a & b \\ c-a & a+b & c \end{vmatrix}$?

A. $a^3 + b^3 + c^3$

B. 3bc

C. $a^3 + b^3 + c^3 - 3abc$

D. 0

Answer: C

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109. If $\begin{vmatrix} p & -q & 0 \\ 0 & p & q \\ q & 0 & p \end{vmatrix} = 0$, then which one of the following is correct ?

A. p is one of the cube roots of unity

B. q is one of the cube roots of unity

C. $\frac{p}{q}$ is one of the cube roots of unity

D. None of the above

Answer: C

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110. If $a^{-1}+b^{-1}+c^{-1}=0$ such that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = \lambda$, then what is λ equal to ?

A. $-abc$

B. abc

C. 0

D. 1

Answer: B

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111. Consider the following statements in respect of the square matrices A and B of same order:

1. A and B are non-zero and AB = 0 $\rightarrow$ either |A| = 0 or |B| = 0

2. $AB = 0 \rightarrow A = 0$ or $B = 0$

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A

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112. For what value of x does $(1 \quad 3 \quad 2)\begin{pmatrix} 1 & 3 & 0 \\ 3 & 0 & 2 \\ 2 & 0 & 1 \end{pmatrix}\begin{pmatrix} 0 \\ 3 \\ x \end{pmatrix} = (0)$ hold ?

A. -1

B. 1

C. $9/8$

D. $-9/8$

Answer: D

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113. Consider the following statements :

1. every zero matrix is a square matrix.

2. A matrix has a numerical value.

3. A unit matrix is a diagonal matrix.

Which of the above statements is/are correct ?

A. 2 only

B. 3 only

C. 2 and 3

D. 1 and 3

Answer: B

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114. If a matrix A has inverses B and C, then which one of the following is correct ?

A. B may not be equal to C

B. B should be equal to C

C. B and C should be unit matrices

D. None of the above

Answer: B

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115. If $A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix}$ then what is determinant of AB ?

A. 0

B. 1

C. 10

D. 20

Answer: A

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116. What is $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix}$ equal to ?

A. 4 abc

B. $4a^2bc$

C. $4a^2b^2c^2$

D. $-4a^2b^2c^2$

Answer: C

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117. 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. B

B. A

C. I

D. $-I$

Answer: A

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118. The sum and product of matrices A and B exist. Which of the following implications are necessarily true ?

1. A and B are square matrices of same order.

2. A and B are non-singular matrices

Select the correct answer using the code given below :

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A

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119. If A is a square matrix such that $A^2 = I$, then A^{-1} is equal to (i) I (ii) 0 (iii) A (iv) I+A

A. A + 1

B. Null matrix

C. A

D. Transpose of A

Answer: C

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120. If any two rows/columns of a square matrix A of order n (>2) are identical; then its determinant is .

A. 0

B. 1

C. -1

D. can be any real value

Answer: A

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121. If $\begin{vmatrix} 8 & -5 & 1 \\ 5 & x & 1 \\ 6 & 3 & 1 \end{vmatrix} = 2$ then what is the value of x ?

A. 4

B. 5

C. 6

D. 8

Answer: D

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122. 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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123. If $A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 1 & 2 \end{bmatrix}$, then what is $B^{-1}A^{-1}$ equal to ?

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

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

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

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

Answer: B

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124. If each element of as third order determinant of value $\triangle$ `$is\mu < ipliedby5thenvalueofthe \neq w \det er \min antis(A)125/\_\(B)25/\_\(C)5/\_\(D)/\_\`

A. is multiplied by r^3.

B. is increased by 3r

C. remains unchanged

D. is multiplied by r

Answer: D

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125. Inverse of diagonal matrix is (A) a diagonal matrix (B) symmetric (C) skew symmetric (D) none of these

A. symmetric matrix

B. skew-symmetric matrix

C. diagonal matrix

D. None of the above

Answer: C

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126. If $A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \\ 7 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 & 7 \\ 4 & 6 & 8 \end{bmatrix}$. Then which one of following is correct ?

A. B is the inverse of A

B. B is the adjoint of A

C. B is the transpose of A

D. None of the above

Answer: C

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127. If the sum of the matrices $\begin{bmatrix} x \\ x \\ y \end{bmatrix}, \begin{bmatrix} y \\ y \\ z \end{bmatrix}$ and $\begin{bmatrix} z \\ 0 \\ 0 \end{bmatrix}$ is the matrix $\begin{bmatrix} 10 \\ 5 \\ 5 \end{bmatrix}$, then what is the value of y ?

A. -5

B. 0

C. 5

D. 10

Answer: B

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128. If the matrix AB is a zero matrix, then which one of the following is correct ?

A. A must be equal to zero matrix or B must be equal to zero matrix.

B. A must be equal to zero matrix and B must be equal to zero matrix.

C. It is not necessary that either A is zero matrix or B is zero matrix.

D. None of the above

Answer: C

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129. If the matrix $\begin{bmatrix} \alpha & 2 & 2 \\ -3 & 0 & 4 \\ 1 & -1 & 1 \end{bmatrix}$ is not invertible, then :

A. $\alpha = -5$

B. $\alpha = 5$

C. $\alpha = 0$

D. $\alpha = 1$

Answer: A

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130. The value of the determinant $\begin{vmatrix} x^2 & 1 & y^2+z^2 \\ y^2 & 1 & z^2+x^2 \\ z^2 & 1 & x^2+y^2 \end{vmatrix}$ is :

A. 0

B. $x^2+y^2+z^2$

C. $x^2 + y^2 + z^2 + 1$

D. None of the above

Answer: A

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131. A square matrix $[a_{ij}]$ such that $a_{ij} = 0$ for $i \neq j$ and $a_{ij} = k$ where k is a constant for i = j is called :

A. diagonal matrix, but not scalar matrix

B. scalar matrix

C. unit matrix

D. None of the above

Answer: B

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132. If A and B are two non-singular square matrices such that AB = A, then which one of the following is correct ?

A. B is an identity matrix

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

C. $B = A^2$

D. Determinant of B is zero

Answer: A

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133. What is the value of the minor of the element 9 in the determinant $\begin{vmatrix} 10 & 19 & 2 \\ 0 & 13 & 1 \\ 9 & 24 & 2 \end{vmatrix}$?

A. -9

B. -7

C. 7

D. 0

Answer: B

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134. The roots of the equation $\begin{vmatrix} 1 & t-1 & 1 \\ t-1 & 1 & 1 \\ 1 & 1 & t-1 \end{vmatrix} = 0$ are

A. 1, 2

B. $-1, 2$

C. $1, \ -2$

D. $-1, \ -2$

Answer: B

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135. The value of the determinant $\begin{vmatrix} m & n & p \\ p & m & n \\ n & p & m \end{vmatrix}$

A. is a perfect cube

B. is a perfect square

C. has linear factor

D. is zero

Answer: C

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136. The determinant of a orthogonal matrix is :

A. ± 1

B. 2

C. 0

D. ± 2

Answer: A

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137. If D is determinant of order 3 and D' is the determinant obtained by replacing the elements of D by their cofactors, then which one of the following is correct ?

A. $D' = D^2$

B. $D' = D^3$

C. $D' = 2D^2$

D. $D' = 3D^3$

Answer: A

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138. Consider the following statements :

1. A matrix is not a number

2. Two determinants of different order may have the same value.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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139. Consider the following statements :

1. The product of two non-zero matrices can never be identity matrix.

2. The product of two non-zero matrices can never be zero matrix.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A::D

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140. Consider the following statements :

1. The matrix $\begin{pmatrix} 1 & 2 & 1 \\ a & 2a & 1 \\ b & 2b & 1 \end{pmatrix}$ is singular.

2. The matrix $\begin{pmatrix} c & 2c & 1 \\ a & 2a & 1 \\ b & 2b & 1 \end{pmatrix}$ is non-singular.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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141. The cofactor of the element 4 in the determinant $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$.

A. 2

B. 4

C. 6

D. -6

Answer: C

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142. If A is a square matrix of order 3 with $|A| \neq 0$, then which one of the following is correct ?

A. $|adjA| = |A|$

B. $|adjA| = |A|^2$

C. $|adjA| = |A|^3$

D. $|adjA|^2 = |A|$

Answer: A

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143. If $A = \begin{pmatrix} i & 0 \\ 0 & -i \end{pmatrix}, B = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}, C = \begin{pmatrix} 0 & i \\ i & 0 \end{pmatrix}$ wher $i = \sqrt{-1}$, then which one of the following is correct ?

A. AB = -C

B. AB = C

C. $A^2 = B^2 = C^2 = I$, where I is the identity matrix

D. $BA \neq C$

Answer: A

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144. If $2A = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$, then what is A^{-1} equal to ?

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

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

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

D. None of these

Answer: D

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145. If $\begin{pmatrix} 2 & 3 \\ 4 & 1 \end{pmatrix} \times \begin{pmatrix} 5 & -2 \\ -3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & -1 \\ 17 & \lambda \end{pmatrix}$, then what is λ equal to ?

A. 7

B. -7

C. 9

D. -9

Answer: B

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146. $\begin{vmatrix} 1 & bc & bc(b+c) \\ 1 & ca & ca(c+a) \\ 1 & ab & ab(a+b) \end{vmatrix} = 0$

A. 0

B. abc

C. ab + bc + ca

D. abc (a + b + c)

Answer: A

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147. Consider the following statements in respect of the matrix

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

1. The matrix A is skew-symmetric.

2. The matrix A is symmetric.

3. The matrix A is invertible.

Which of the above statements is/are correct ?

A. 1 only

B. 3 only

C. 1 and 3

D. 2 and 3

Answer: A

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148. Consider two matrices $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & -4 \\ 2 & 1 & -4 \end{bmatrix}$. Which one of the following is correct ?

A. B is the right inverse of A

B. B is the left inverse of A

C. B is the both sided inverse of A

D. None of the above

Answer: B

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149. One of the roots of $\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = 0$ is :

A. abc

B. a + b + c

C. $-(a+b+c)$

D. $-abc$

Answer: C

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150. If A is any matrix, then the product AA is defined only when A is a matrix of order m $\times$ n where :

A. m $>$ n

B. m $<$ n

C. m = n

D. m $\leq$ n

Answer: C

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151. If A is a skew-symmetric matrix of odd order $n,$ then $|A| = 0$

A. Zero

B. One

C. Negative

D. Depends on the matrix

Answer: A

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152. If any two adjacent rows or columns of a determinant are intercharged in position, the value of the determinant :

A. Becomes zero

B. Remains the same

C. Changes its sign

D. Is doubled

Answer: C

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153. If $a \neq b \neq c$ are all positive, then the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

A. non-negative

B. non-positive

C. negative

D. positive

Answer: C

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154. Let A and B be two matrices such that AB = A and BA = B. Which of the following statements are correct ?

1. $A^2 = A$

2. $B^2 = B$

3. $(AB)^2 = AB$

Select the correct answer using the code given below :

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: D

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155. $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$ =x+iy then

A. 3

B. 2

C. 1

D. 0

Answer: D

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

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

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

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

D. $\begin{pmatrix} 1 & -4 \\ 0 & -1 \end{pmatrix}$

Answer: A

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157. Consider the following statements :

1. Determinant is a square matrix.

2. Determinant is a number associated with a square matrix.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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158. If A is an invertible matrix of order 2, then det $\left(A^{-1}\right)$ is equal to(a) det (A) (B) $\frac{1}{\det(A)}$ (C) 1 (D) 0

A. det A

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

C. 1

D. None of the above

Answer: B

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

A. A is non-singular.

B. A is singular.

C. A is symmetric.

D. A is skew symmetric.

Answer: A

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

A. 2

B. 3

C. -1

D. 5

Answer: D

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161. If $\begin{vmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{vmatrix} = 0$, then which one of the following is correct ?

A. `(a)/(b) is one of the cube roots of unity.

B. $\frac{a}{b}$ is one of the cube roots of -1.

C. a is one of the cube roots of unity.

D. b is one of the cube roots of unity.

Answer: B

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162. If A and B are square matrices of order 3 such that $|A| = -1, |B| = 3,$ then $|3AB|$ equals

A. 3

B. -9

C. -27

D. None of these

Answer: C

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163. Which one of the following matrices is an elementary matrix ?

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

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

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

D. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 5 & 2 \end{bmatrix}$

Answer: B

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164. If $A = \begin{bmatrix} 2 & 7 \\ 1 & 5 \end{bmatrix}$ then that is A + $3A^{-1}$ equal to ?

A. 3 I

B. 5 I

C. 7 I

D. None of these

Answer: C

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165. The matrix $\begin{bmatrix} 0 & -4+i \\ 4+I & 0 \end{bmatrix}$ is

A. symmetric

B. skew-symmetric

C. Hermitian

D. skew-Hermitian

Answer: D

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166. Consider the following in respect of two non-singular matrices A and B of same order :

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

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

Which of the above is/ar correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

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167. If $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}, B = \begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix}$ and $A = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$ satisfy the equation AX = B, then the matrix A is equal to

A. $\begin{bmatrix} -7 & 26 \\ 1 & -5 \end{bmatrix}$

B. $\begin{bmatrix} 7 & 26 \\ 4 & 17 \end{bmatrix}$

C. $\begin{bmatrix} -7 & -4 \\ 26 & 13 \end{bmatrix}$

D. $\begin{bmatrix} -7 & 26 \\ -6 & 23 \end{bmatrix}$

Answer: A

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168. $A = \begin{bmatrix} x+y & y \\ 2x & x-y \end{bmatrix}$

$B = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$ and $C = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

If AB = C, then what is A^2 equal to ?

A. $\begin{bmatrix} 6 & -10 \\ 4 & 26 \end{bmatrix}$

B. $\begin{bmatrix} -10 & 5 \\ 4 & 24 \end{bmatrix}$

C. $\begin{bmatrix} -5 & -6 \\ -4 & -20 \end{bmatrix}$

D. $\begin{bmatrix} -5 & -7 \\ -5 & 20 \end{bmatrix}$

Answer: A

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169. The value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ is

A. x + y

B. x - y

C. xy

D. 1 + x + y

Answer: C

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

A. $E(\alpha\beta)$

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

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

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

Answer: C

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171. The matrix $A = \begin{bmatrix} 1 & 3 & 2 \\ 1 & x-1 & 1 \\ 2 & 7 & x-3 \end{bmatrix}$ will have inverse for every real number x except for

A. $x = \frac{11 \pm \sqrt{5}}{2}$

B. $x = \frac{9 \pm \sqrt{5}}{2}$

C. $x = \frac{11 \pm \sqrt{3}}{2}$

D. $x = \frac{9 \pm \sqrt{3}}{2}$

Answer: A

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172. If the value of the determinants $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix}$ is positive then:

A. cannot be less than 1

B. is greater than -8

C. is less than -8

D. must be greater than 8

Answer: B

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173. Consider the following statements in respect of the determinant $\begin{vmatrix} \cos^2\left(\frac{\alpha}{2}\right) & \sin^2\left(\frac{\alpha}{2}\right) \\ \sin^2\left(\frac{\beta}{2}\right) & \cos^2\left(\frac{\beta}{2}\right) \end{vmatrix}$ where α, β are complementary angles

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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174. If $A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & -3 & 4 \end{bmatrix}$, then the matrix X for which 2X + 3A = 0 holds true is

A. $\begin{bmatrix} -\frac{3}{2} & 0 & -3 \\ -3 & -\frac{9}{2} & -6 \end{bmatrix}$

B. $\begin{bmatrix} \frac{3}{2} & 0 & -3 \\ 3 & -\frac{9}{2} & -6 \end{bmatrix}$

C. $\begin{bmatrix} \frac{3}{2} & 0 & 3 \\ 3 & \frac{9}{2} & 6 \end{bmatrix}$

D. $\begin{bmatrix} -\frac{3}{2} & 0 & 3 \\ -3 & \frac{9}{2} & -6 \end{bmatrix}$

Answer: D

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175. If $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -2 & -1 \\ 6 & 12 & 6 \\ 5 & 10 & 5 \end{bmatrix}$ then which of the following is/are correct ?

1. A and B commute.

2. AB is a null matrix.

Select the correct answer using the code given below :

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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176. If A is an invertible matrix of order n and k is any positive real number, then the value of $[\det(kA)]^1 \det A$ is

A. k^{-n}

B. k^{-1}

C. k^n

D. nk

Answer: A

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177. If A is an orthogonal matrix of order 3 and B = $\begin{bmatrix} 1 & 2 & 3 \\ -3 & 0 & 2 \\ 2 & 5 & 0 \end{bmatrix}$, then which of the following is/are correct ?

1. $|AB| = \pm 47$

2. AB = BA

Select the correct answer using the code given below :

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A

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178. If a, b, c are real numbers, then the value the determinant $\begin{vmatrix} 1-a & a-b-c & b+c \\ 1-b & b-c-a & c+a \\ 1-c & c-a-b & a+b \end{vmatrix}$ is

A. 0

B. $(a-b)(b-c)(c-a)$

C. $(a+b+c)^2$

D. $(a+b+c)^3$

Answer: A

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179. Cosider the function $f(x) = \begin{vmatrix} x^3 & \sin x & \cos x \\ 6 & -1 & 0 \\ p & p^2 & p^3 \end{vmatrix}$, where p is a constant.

What is the value of f'(0) ?

A. p^3

B. $3p^3$

C. $6p^3$

D. $-6p^3$

Answer: D

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180. Cosider the function $f(x) = \begin{vmatrix} x^3 & \sin x & \cos x \\ 6 & -1 & 0 \\ p & p^2 & p^3 \end{vmatrix}$, where p is a constant.

What is the value of p for which f''(0) = 0 ?

A. $-\frac{1}{6}$ or 0

B. -1 or 0

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

D. -1 or 1

Answer: A

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181. If A is a square matrix, then what is adj $A^T - (adjA)^T$ equal to ?

A. 2|A|

B. Null matrix

C. unit matrix

D. None of the above

Answer: B

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182. Consider the following in respect of the matrix $A = \begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$:

1. $A^2 = -A$

2. $A^3 = 4A$

Which of the above is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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183. Which of the following determinants have value 'zero'?

1. $\begin{vmatrix} 41 & 1 & 5 \\ 79 & 7 & 9 \\ 29 & 5 & 3 \end{vmatrix}$
2. $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$
3. $\begin{vmatrix} 0 & c & b \\ -c & 0 & a \\ -b & -a & 0 \end{vmatrix}$

Select the correct answer using the code given below.

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: D

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184. The system of linear equations $kx + y + z = 1, x + ky + z = 1$ and $x + y + kz = 1$ has a unique solution under which one of the following conditions ?

A. $k \neq 1$ and $k \neq -2$

B. $k \neq 1$ and $k \neq 2$

C. $k \neq -1$ and $k \neq -2$

D. $k \neq -1$ and $k \neq 2$

Answer: A

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185. If A is semy square matrix of order 3 and det A = 5, then what is det $\left[(2A)^{-1}\right]$ equal to ?

A. $1/10$

B. $2/5$

C. $8/5$

D. $1/40$

Answer: D

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186. What is $\begin{bmatrix} x & y & z \end{bmatrix} \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ equal to ?

A. $\begin{bmatrix} ax + hy + gz + h + b + f & g + f + c \end{bmatrix}$

B. $\begin{bmatrix} a & h & g \\ hx & by & fz \\ g & f & c \end{bmatrix}$

C. $\begin{bmatrix} ax + hy + gz \\ hx + by + fz \\ gx + fy + cz \end{bmatrix}$

D. $\begin{bmatrix} ax + hy + gz & hx + by + fz & gx + gy + cz \end{bmatrix}$

Answer: D

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187. Let $ax^3 + bx^2 + cx + d = \begin{vmatrix} x+1 & 2x & 3x \\ 2x+3 & x+1 & x \\ 2-x & 3x+4 & 5x-1 \end{vmatrix}$ then what is the value of c

A. -1

B. 34

C. 35

D. 50

Answer: C

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188. Let $ax^3 + bx^2 + cx + d = \begin{vmatrix} x+1 & 2x & 3x \\ 2x+3 & x+1 & x \\ 2-x & 3x+4 & 5x-1 \end{vmatrix}$ then what is the value of c

A. 62

B. 63

C. 65

D. 68

Answer: B

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189. If $m = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $n = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, then what is the value of the determinant of $m\cos\theta - n\sin\theta$

A. -1

B. 0

C. 1

D. 2

Answer: C

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190. If $f\{x\} = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then which of the following are correct ?

1. $f(\theta) \times f(\phi) = f(\theta + \phi)$

2. The value of the determinant of the matrix $f(\theta) \times f(\phi)$ is 1.

3. The determinant of f(x) is an even function.

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: D

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191. Which of the following are correct in respect of the system of equations $x + y + z = 8$ $x - y + 2z = 6$ and $3x - y + 5z = k$ 1)They have no solution if k=15 2)Theyhave infinitely many solutions if k=20

3)They have a unique solution if k=25 Select the correct answer using the code given below a) 1 and 2 only b) 2 and 3 only c)1 and 3 only d)1,2 and 3

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: A

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192. $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ -1 & -2 \end{bmatrix}$, then which of the following is/are correct ?

1. $AB\left(A^{-1}B^{-1}\right)$ is a unit matrix.

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

Select the correct answer using the code given below :

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

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193. For the system of linear equations $2x + 3y + 5z = 9, 7x + 3y - 2z = 8$ and $2x + 3y + \lambda z = \mu$

Under what condition does the above system of equations have infinitely many solutions ?

A. $\lambda = 5$ and $\mu \neq 9$

B. $\lambda = 5$ and $\mu = 9$

C. $\lambda = 9$ and $\mu = 5$

D. $\lambda = 9$ and $\mu \neq 5$

Answer: B

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194. For the system of linear equations $2x + 3y + 5z = 9, 7x + 3y - 2z = 8$ and $2x + 3y + \lambda z = \mu$

Under what condition does the above system of equations have unique solutions ?

A. $\lambda = 5$ and $\mu = 9$

B. $\lambda \neq 9$ and $\mu = 7$ only

C. $\lambda \neq 5$ and μ has any real value

D. λ has any real value and $\mu \neq 9$

Answer: C

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195. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and determinant $\left(A^3\right) = 125,$ 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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196. 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. det (B)

B. det (A)

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

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

Answer: B

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197. If $a \neq b \neq c$, are value of x which satisfies the equation

$$\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$$ is given by

A. a

B. b

C. c

D. 0

Answer: D

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198. If $A = [\cos\alpha \sin\alpha - \sin\alpha \cos\alpha]$, then verify that $A^T A = I_2$.

A. Null matrix

B. Identify matrix

C. A

D. $-A$

Answer: B

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199. For the system of equaltions :

$x + 2y + 3z = 1$

$2x + y + 3z = 2$

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

A. have the unique solution

B. have infinitely many solutions

C. are inconsistent

D. None of the above

Answer: A

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200. $A = \begin{bmatrix} x+y & y \\ x & x-y \end{bmatrix}, B = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$ and $C = \begin{bmatrix} 4 \\ -2 \end{bmatrix}$. If AB = C, then what is A^2 equal to ?

A. $\begin{bmatrix} 4 & 8 \\ -4 & -16 \end{bmatrix}$

B. $\begin{bmatrix} 4 & -4 \\ 8 & -16 \end{bmatrix}$

C. $\begin{bmatrix} -4 & -8 \\ 4 & 12 \end{bmatrix}$

D. $\begin{bmatrix} -4 & -8 \\ 8 & 12 \end{bmatrix}$

Answer: D

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201. What is the value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+xyz & 1 \\ 1 & 1 & 1+xyz \end{vmatrix}$?

A. $1+x+y+z$

B. $2xyz$

C. $x^2y^2z^2$

D. $2x^2y^2z^2$

Answer: C

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202. If $\begin{vmatrix} x & y & 0 \\ 0 & x & y \\ y & 0 & x \end{vmatrix} = 0$, then which one of the following is correct ?

A. $\frac{x}{y}$ is one of the cube roots of unity

B. x is one of the cube roots of unity

C. y is one of the cube roots of unity

D. $\frac{x}{y}$ is one of the cube roots of -1

Answer: D

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203. Consider the set A of all determinants of order 3 with entries 0 or 1 only. Let B be the subset of A consisting of all determinants with value 1. Let C be the subset of the set of all determinants with value -1. Then

A. C is empty

B. B has as many elements as C

C. A = B $\cup$ C

D. B has thrice as many elements as C

Answer: B

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204. If A = $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then what is A^3 equal to ?

A. $\begin{bmatrix} \cos 3\theta & \sin 3\theta \\ -\sin 3\theta & \cos 3\theta \end{bmatrix}$

B. $\begin{bmatrix} \cos^3\theta & \sin^3\theta \\ -\sin^3\theta & \cos^3\theta \end{bmatrix}$

C. $\begin{bmatrix} \cos 3\theta & -\sin 3\theta \\ \sin 3\theta & \cos 3\theta \end{bmatrix}$

D. $\begin{bmatrix} \cos^3\theta & -\sin^3\theta \\ \sin^3\theta & \cos^3\theta \end{bmatrix}$

Answer: A

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205. 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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206. if $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then $A^4 = ?$

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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207. The matrix A has x rows and $(x+5)$ column. If the matrix B has y rows and $(11-y)$ columns & both $ABandBA$ exist, then $x = 8$ (b) $x = 3\, y = 6$ (d) $y = 8$

A. 8 and 3

B. 3 and 4

C. 3 and 8

D. 8 and 8

Answer: C

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208. If A is a square matrix, then what is adj $A^T - (adjA)^T$ equal to ?

A. A

B. 2|A|I, where I is the identity matrix

C. null matrix whose order is same as that of A

D. unit matrix whose order is same as that of A

Answer: C

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209. The value of the determinant $\begin{vmatrix} \cos^2\frac{\theta}{2} & \sin^2\frac{\theta}{2} \\ \sin^2\frac{\theta}{2} & \cos^2\frac{\theta}{2} \end{vmatrix}$ for all values of θ, is

A. 1

B. $\cos\theta$

C. $\sin\theta$

D. $\cos 2\theta$

Answer: B

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210. If a, b, c are non-zero real numbers, then the inverse of the matrix $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ is equal to

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

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

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

D. $\frac{1}{abc}\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$

Answer: A

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211. The system of equation $kx + y + z = 1, x + ky + z = k$ and $x + y + kz = k^2$ has no solution if k equals

A. 0

B. 1

C. -1

D. -2

Answer: D

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212. The value of the determinant $\begin{vmatrix} 1-\alpha & \alpha-\alpha^2 & \alpha^\circ \\ 1-\beta & \beta-\beta^2 & \beta^2 \\ 1-\gamma & \gamma-\gamma^2 & \gamma^2 \end{vmatrix}$ is equal to

A. $(\alpha-\beta)(\beta-\gamma)(\alpha-\gamma)$

B. $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

C. $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$

D. 0

Answer: B

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213. The adjoint of the matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 0 & 3 & 1 \end{bmatrix}$ is

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

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

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

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

Answer: B

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214. If $A = \begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix}$, then which one of the following is correct ?

A. $A^2 = -2A$

B. $A^2 = -4A$

C. $A^2 = -3A$

D. $A^2 = 4A$

Answer: B

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215. If p + q + r = a + b + c = 0, then the determinant $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix}$ equals

A. 0

B. 1

C. pa + qb + rc

D. pa + qb + rc + a + b + c

Answer: A

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216. If the matrix $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is singular, then what is one of the values of θ?

A. $\begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

B. $\begin{pmatrix} \cos\theta & \sin\theta & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{pmatrix}$

C. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{pmatrix}$

D. $\begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

Answer: A

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217. If A is a 2×3 matrix and AB is a 2×5 matrix, then B must be a

A. 3×5 matrix

B. 5×3 matrix

C. 3×2 matrix

D. 5×2 matrix

Answer: A

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218. if $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $A^2 - kA - I_2 = 0$ then the value of k is

A. 4

B. -4

C. 8

D. -8

Answer: A

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219. A square matrix A is called orthogonal if

Where A' is the transpose of A.

A. $A = A^2$

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

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

D. $A = A'$

Answer: B

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220. For a square matrix A, which of the following properties hold ?

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

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

3. $(\lambda A)^{-1}\lambda A^{-1}$ where λ is a scalar

Select the correct answer using the code given below :

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: A

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221. Which one of the following factors does the expansions of the determinant $\begin{pmatrix} x & y & 3 \\ x^2 & 5y^2 & 9 \\ x^3 & 10y^3 & 27 \end{pmatrix}$ contain ?

A. x - 3

B. x - y

C. Y - 3

D. x - 3y

Answer: A

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222. What is the adjoint of the matrix $\begin{pmatrix} \cos(-\theta) & -\sin(-\theta) \\ -\sin(-\theta) & \cos(-\theta) \end{pmatrix}$?

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

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

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

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

Answer: A

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223. If A and B are two invertible matrices of same order, the $(AB)^{-1}$ is

(A) AB (B) BA (C) $A^{-1}B^{-1}$ (D) does not exist

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

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

C. $B^{-1}A$

D. $A^{-1}B$

Answer: A

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224. If $a+b+c=0,$ one root of $|a-xcbcb-xabac-x|=0$ is $x=1$

b. $x=2$ c. $x=a^2+b^2+c^2$ d. $x=0$

A. x = a

B. $x=\sqrt{\frac{3(a^2+b^2+c^2)}{2}}$

C. $x=\sqrt{\frac{2(a^2+b^2+c^2)}{3}}$

D. x = 0

Answer: D

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225. What should be the value of x so that the matrix $\begin{pmatrix} 2 & 4 \\ -8 & x \end{pmatrix}$ does not have an inverse ?

A. 16

B. -16

C. 8

D. -8

Answer: B

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226. The system of equation

$2x + y - 3z = 5$

$3x - 2y + 2z = 5$ and

$5x - 3y - z = 16$

A. is inconsistent

B. is consistent, with unique solution

C. is consistent, with infinitely many solutions

D. has its solution lying along x-axis in three-dimensional space

Answer: B

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227. If u, v and w (all positive) are the p^{th}, q^{th} and r^{th} terms of a GP, the determinant of the matrix $\begin{pmatrix} \text{In} & u & pl \\ \text{In} & v & ql \\ \text{In} & w & rl \end{pmatrix}$ is

A. 0

B. 1

C. (p - q) (q - r) (r - p)

D. In u $\times$ In v $\times$ In w

Answer: A

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228. Consider the following in respect of matrices A, B and C of same order :

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

2. $(AB)' = AB'$

3. $(ABC)' = C'B'A'$

Where A' is the transpose of the matrix A. Which of the above are correct ?

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: C

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229. Let matrix B be the adjoint of a square matrix A, I be the identity matrix of the same order as A. If k ($\neq$ 0) is the determinant of the matrix A, then what is AB equal to ?

A. I

B. k I

C. $k^2 I$

D. $(1/k)I$

Answer: B

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230. What is the determinant of the matrix $\begin{pmatrix} x & y & y+z \\ z & x & z+x \\ y & z & x+y \end{pmatrix}$?

A. $(x-y)(y-z)(z-x)$

B. $(x-z)(z-x)$

C. $(y-z)(z-x)$

D. $(x-z)^2(x+y+z)$

Answer: D

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231. If A, B and C are the angles of a triangle and

$$\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix} = 0,$$ then the triangle ABC is

A. The triangle ABC is isosceles

B. The triangle ABC is equailateral

C. The triangle ABC is scalene

D. No conclusion can be drawn with regard to the nature of the triangle

Answer: A

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232. Consider the following in respect of matrices A and B of same order :

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

2. $(A - I)(I + A) = 0 \leftrightarrow A^2 = I$

Where I is the identity matrix and O is the null matrix.

Which of the above is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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233. What is the area of the triangle with vertices $\left(x_1, \frac{1}{x_1}\right), \left(x_2, \frac{1}{x_2}\right), \left(x_3, \frac{1}{x_3}\right)$?

A. $|(x_1 - x_2)(x_2 - x_3)(x_3 - x_1)|$

B. 0

C. $\left|\frac{(x_1 - x_2)(x_2 - x_3)(x_3 - x_1)}{x_1 x_2 x_3}\right|$

D. $\left|\frac{(x_1 - x_2)(x_2 - x_3)(x_3 - x_1)}{2x_1 x_2 x_3}\right|$

Answer: D

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234. If B = $\begin{bmatrix} 3 & 2 & 0 \\ 2 & 4 & 0 \\ 1 & 1 & 0 \end{bmatrix}$, then what is adjoint of B equal to ?

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

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

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

D. It does not exist

Answer: A

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235. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then the matrix A is/an

A. Singular matrix

B. Involutory matrix

C. Nilpotent matrix

D. Inempotent matrix

Answer: B

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236. If A is a identity matrix of order 3, then its inverse $\left(A^{-1}\right)$

A. is qual to null matrix

B. is equal to A

C. is equal to 3A

D. does not exist

Answer: B

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237. A is a square matrix of order 3 such that its determinant is 4. What is the determinant of its transpose ?

A. 64

B. 36

C. 32

D. 4

Answer: D

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238. If A is square matrix of order n $>$ 1, then which one of the following is correct ?

A. det (-A) = det A

B. det (-A) = $(-1)^n$ det A

C. det (-A) = -det A

D. det (-A) = n det A

Answer: B

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239. Let A and B be (3 $\times$ 3) matrices with det A = 4 and det B = 3. What is det (2AB) equal to ?

A. 96

B. 72

C. 48

D. 36

Answer: A

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240. Let A and B be (3 $\times$ 3) matrices with det A = 4 and det B = 3.

What is det (3 AB^{-1})equal to ?

A. 12

B. 18

C. 36

D. 48

Answer: C

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