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MATHS

AIMED AT STUDENTS PREPARING FOR IIT JEE EXAMINATION

MATRICES

Solved Examples

1. Find $a2 \times 3$ matrix $A = \left[a_{ij}\right]$. Whose clements are given by $a_{ij} = \frac{i - j}{i + j}$.

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2. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 6 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ then find the matrix X, such that $A + B - X = 0$. What is the order of the matrix X ?

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3. If $A = \begin{bmatrix} 2 & 3 & -1 \\ 7 & 8 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & -4 & -1 \end{bmatrix}$ then find A+B.

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4. Find the trace of A if $A = \begin{bmatrix} 1 & 2 & -\frac{1}{2} \\ 0 & -1 & 2 \\ -\frac{1}{2} & 2 & 1 \end{bmatrix}$.

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5. If $A = \begin{bmatrix} 4 & -5 \\ -2 & 3 \end{bmatrix}$ then find $-5A$.

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6. What is the number of all possible matrices with each entry as 0 or 1 ?

(i) If the order of matrices is 2×2

If the order of matrices is 2×3

(iii) If the order of matrices is 3×3

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7. If a matrix has 7 elements what are the possible orders it can have ?

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8. If a matrix has 24 elements, what are the possible orders it can have?

What, if it has 13 elements?

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9. Find the product $\begin{bmatrix} -1 & 4 & 2 \end{bmatrix} \begin{bmatrix} 5 \\ 1 \\ 3 \end{bmatrix}$

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10. If $A = \begin{vmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{vmatrix}$, then find A^4

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11. If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ then examine whether A and B commute with respect to multiplication of matrices.

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12. If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then $A^3 - 3A^2 - A + 9I =$

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13. If A is idempotent, show that $B = I - A$ is idempotent and show that $AB = BA = 0$.

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14. IF $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then show that for all the positive integers, $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}$

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15. IF $A = \begin{bmatrix} 7 & -2 \\ -1 & 2 \\ 5 & 3 \end{bmatrix}, B = \begin{bmatrix} -2 & -1 \\ 4 & 2 \\ -1 & 0 \end{bmatrix}$ then find AB' and BA'

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16. For any $n \times n$ matrix A, prove that A can be uniquely expressed as a sum of a symmetric matrix and a skew symmetric matrix.

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17. If $A = \begin{bmatrix} 0 & 2 & 1 \\ -2 & 0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is skew symmetric matrix, then find x.

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18. If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & -2 & y \end{bmatrix}$ such that $AA^T = A^TA = I$, find (x,y).

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19. If $A = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -3 & 0 \\ 5 & 4 \end{bmatrix}$ then verify that $(AB)^T = B^TA^T$

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20. If $A = \begin{bmatrix} -1 & 2 \\ 0 & 1 \end{bmatrix}$ then AA^T. Do A and A^T commute with respect to multiplication of matrices ?

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21. In the matrix $\begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 2 \\ 4 & 5 & 6 \end{bmatrix}$ find the minor and cofactor of the element '5'.

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22. Show that $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = \begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix} = \left(a^3 + b^3 + c^3 - 3abc\right)^2$

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23. Find the value of x, if $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0.$

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24. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix}$ and $\begin{vmatrix} a & a^2 & 1 \\ b & b^2 & 1 \\ c & c^2 & 1 \end{vmatrix} \neq 0$ then show that $abc = -1$.

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25. Show that $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

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26. Show that the determinant of skew - symmetric matrix of order three is always zero.

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27. If ω is complex cube root of 1 then S.T $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix} = 0$

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28. Find the adjoint and Inverse of the matrix $A = \begin{bmatrix} 2 & -3 \\ 4 & 6 \end{bmatrix}$

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29. Find the adjoint and the inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$

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30. Find the adjoint and inverse of the matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$

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31. If $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 0 & 1 & -1 \end{bmatrix}$ find the rank A.

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32. The rank of $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 1 & -1 & 4 \\ 2 & 2 & 8 \end{bmatrix}$ is

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33. Find 'a' such that Rank (A)=2 where $A = \begin{bmatrix} 2 & 1 & 1 & 2 \\ 3 & 0 & -1 & 4 \\ 7 & 2 & a & 8 \end{bmatrix}$

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34. Determine the value of k if the rank of $\begin{bmatrix} 1 & -2 & 3 & 1 \\ 2 & 3 & 1 & 1 \\ 4 & -1 & 7 & 3 \\ 5 & 4 & 5 & k \end{bmatrix}$ is 2.

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35. Show that the following system of equations is consistent and solve it completely.

$x + y + 4z = 6, \quad 3x + 2y - 2z = 9, \quad 5x + y + 2z = 13$

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36. Show that the followiing system of equations is consistent and solve it completely.

$x + y + z = 3, \quad 2x + 2y - z = 3, \quad x + y - z = 1$

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37. Examine whether the following system of equations are consistent or inconsistent and if consistent find the complete solution.

$x + y + z = 4, \quad 2x + 5y - 2z = 3, \quad x + 7y - 7z = 5$

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38. Show that the system of equations given below is not consistant

$2x + 6y = -11$

$6x + 20y - 6z = -3$

$6y - 18z = -1$

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39. Solve the system of equations

$x - y + z = 0, x + 2y - z = 0, 2x + y + 3z = 0$

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40. Solve the system of homogenous equations

$3x + y - 2z = 0, x + y + z = 0, x - 2y + z = 0$

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41. If the system of equations

$(a + 2)^3 x + (1 + 7)^3 y + (a + 15)^3 z = 0$

$(a + 2)x + (a + 7)y + (a + 15)z = 0$

$x + y + z = 0$

possesses a non - trivial solution, find a.

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42. Solve the equations $x - 3y + 2z = 8, 3x + 4y + z = 5, -4x + 2y - 9z = 2$ using Crammer's method

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43. Solve the following system of equations by matrix inversion method

$5x - 6y + 4z = 15, 7x + 4y - 3z = 19, 3x + y + 6z = 46$

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44. Solve the system of equations $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$ using Gauss Jordan method.

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45. Solve the following system of equations by using Cramer,s ruel .

$3x + 4y + 5z = 18, 2x - y + 8z = 13, 5x - 2y + 7z = 20$

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46. Solve the following equations by using matrix inversion method

$3x + 4y + 5z = 18$

$2x - y + 8z = 13$

$5x - 2y + 7z = 20$

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47. Solve the following system of equations by using Cramer,s ruel .

$3x + 4y + 5z = 18, 2x - y + 8z = 13, 5x - 2y + 7z = 20$

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48. Solve the system of equations

$2x + 4y - z = 0, x + 2y + 2z = 5, 3x + 6y - 7z = 2$ by Gauss Jordan Method.

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49. Solve the system of equations $x + y + z = 3, 2x + 2y - z = 3, x + y - z = 1$ by Gauss Jordan method.

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Additional Solved Examples

1. If $A = \begin{bmatrix} 2 & -2 \\ 2 & 3 \end{bmatrix}$ and $A^2 - 5A + kI_2 = 0$ then k =

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2. If $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$ and if $A^3 - 13A + kI = 0$, then find k.

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3. If $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ and if $(A + 2I)^{-1} = k_1 A + k_2 I$ then find $\left(k_1, k_2\right)$.

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4. If $a_1, a_2, a_3, \ldots, a_n \ldots$ are in G.P. and $a_i > 0$ for each i, then the value of

$$\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$$

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5. Prove that

$$\begin{vmatrix} (1+ax)^2 & (1+ay)^2 & (1+az)^2 \\ (1+bx)^2 & (1+by)^2 & (1+bz)^2 \\ (1+cx)^2 & (1+cy)^2 & (1+cz)^2 \end{vmatrix} = 2(a-b)(b-c)(c-a)(x-y)(y-z)(z-x).$$

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6. If $f(\theta) = \begin{vmatrix} \cos^2\theta & \cos\theta\sin\theta & -\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta & \cos\theta \\ \sin\theta & -\cos\theta & 0 \end{vmatrix}$ then $f\left(\frac{\pi}{12}\right) =$

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7. If $D_r = \begin{vmatrix} 2r-1 & {}^mC_r & 1 \\ m^2-1 & 2^m & m+1 \\ \sin^2\left(m^2\right) & \sin^2(m) & \sin^2(m+1) \end{vmatrix}$ then find $\sum_{r=0}^{m} D_r$.

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8. Prove that

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

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9. If $2S = a + b + c$, prove that

$$\begin{vmatrix} a^2 & (S-a)^2 & (S-a)^2 \\ (S-b)^2 & b^2 & (S-b)^2 \\ (S-c)^2 & (S-c)^2 & c^2 \end{vmatrix} = 2S^3(S-a)(S-b)(S-c).$$

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Exercise 3 1 Very Short Answer Questions

1. Construct a 3×2 matrix $A = [a_{ij}]$, whose elements are given by

(i) $a_{ij} = i + j$ (ii) $a_{ij} = \frac{1}{2}|i - 3j|$

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2. Specify the order of the following matrices

$$\begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}$$

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3. Specify the order of the following matrices

$[2\ 1\ 3\ -4]$

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4. Specify the order of the following matrices

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

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5. Specify the order of the following matrices

$$\begin{bmatrix} 0 & 3 & 6 & -18 \\ 6 & 9 & 12 & 0 \\ 12 & 15 & 1 & 3 \end{bmatrix}$$

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6. Find the trace of $\begin{bmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$

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7. Find the additive inverse of A where $A = \begin{bmatrix} i & 0 & 1 \\ 0 & -i & 2 \\ -1 & 1 & 5 \end{bmatrix}$

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8. Write the following as a single matrix.

(i) $[2\ 1\ 3] + [0\ 0\ 0]$

(ii) $\begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$

(iii) $\begin{bmatrix} 3 & 9 & 0 \\ 1 & 8 & -2 \end{bmatrix} + \begin{bmatrix} 4 & 0 & 2 \\ 7 & 1 & 4 \end{bmatrix}$

(iv) $\begin{bmatrix} -1 & 2 \\ 1 & -2 \\ 3 & -1 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ -1 & 0 \\ -2 & 1 \end{bmatrix}$

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

$A + B + C =$

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

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

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12. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, find $3B - 2A$.

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13. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ and $2X + A = B$ then find X.

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14. IF $A = \begin{bmatrix} 3 & 2 & -1 \\ 2 & -2 & 0 \\ 1 & 3 & 1 \end{bmatrix} B = \begin{bmatrix} -3 & -1 & 0 \\ 2 & 1 & 3 \\ 4 & -1 & 2 \end{bmatrix}$ and X=A+B then find X.

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15. If $\begin{bmatrix} x-3 & 2y-8 \\ z+2 & 6 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ -2 & a-4 \end{bmatrix}$ then find x,y,z & a.

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16. If $\begin{bmatrix} x-1 & 2 & y-5 \\ z & 0 & 2 \\ 1 & -1 & 1+a \end{bmatrix} = \begin{bmatrix} 1-x & 2 & -y \\ 2 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}$ then find the values of x,y,z and a.

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17. If $A = \begin{bmatrix} -1 & 3 \\ 4 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & 1 \\ 3 & -5 \end{bmatrix}, X = \begin{bmatrix} x_1 & x_2 \\ x_3 & x_4 \end{bmatrix}$ and $A + B = x$ then find the values of x_1, x_2, x_3 and x_4.

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18. If $\begin{bmatrix} x-1 & 2 & 5-y \\ 0 & z-1 & 7 \\ 1 & 0 & a-5 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 7 \\ 1 & 0 & 0 \end{bmatrix}$ find x,y,z,a

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19. If A = diag $(1, -1, 2)$ and B = diag $(2, 3, -1)$ find $3A + 4B$.

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20. Two factories I and II produce three varieties of pens namely, Gel, Ball and Ink pens. The sale in namely, Gel, Ball and Ink pens by both the factories in the month of September and October in a year are given by

the following matries A and B.

September sales (in Rupees)

$$A = \begin{matrix} \text{Gel} & \text{Ball} & \text{Ink} \\ \begin{bmatrix} 1000 & 2000 & 3000 \\ 5000 & 3000 & 1000 \end{bmatrix} & & \end{matrix} \begin{matrix} \\ \textit{Factory I} \\ \textit{Factory II} \end{matrix}$$

October sales (in Rupees)

$$B = \begin{matrix} \text{Gel} & \text{Ball} & \text{Ink} \\ \begin{bmatrix} 500 & 1000 & 600 \\ 2000 & 1000 & 1000 \end{bmatrix} & & \end{matrix} \begin{matrix} \\ \textit{Factory I} \\ \textit{Factory II} \end{matrix}$$

(i) Find the combined sales in September and October for each factory in each variety.

(ii) Find the decrease in sales from September to October.

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Exercise 3 2 Very Short Answer Questions

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

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2. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, find A^2.

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3. IF $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$ then find the value of k

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4. If $A = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$, $B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ and I is the unit matrix of order 2, then show that

(i) $A^2 = B^2 = C^2 = -I$ (ii) $AB = -BA = -C$.

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5. Find the following products whenever possible

(i) $\begin{bmatrix} 2 & 1 & 4 \\ 6 & -2 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$

(ii) $\begin{bmatrix} 3 & -2 \\ 1 & 6 \end{bmatrix} \begin{bmatrix} 4 & -1 \\ 2 & 5 \end{bmatrix}$

(iii) $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 0 & 2 \\ 2 & 1 & 2 \end{bmatrix} \begin{bmatrix} -2 & -3 & 4 \\ 2 & 2 & -3 \\ 1 & 2 & -2 \end{bmatrix}$

(iv) $\begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix} \begin{bmatrix} 2 & 1 & 4 \\ 6 & -2 & 3 \end{bmatrix}$

(v) $\begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix} \begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$

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6. If $A = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 0 & 4 \end{bmatrix}$, then find AB. Find BA if it exists.

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7. If $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$ do AB and BA exist? If they exist, find them.

Do A and B commute with respect to multiplication?

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8. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & -2 \\ -1 & 0 \\ 2 & -1 \end{bmatrix}$ then find AB and BA.

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9. IF $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then find A^4.

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10. IF $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ then find A^3.

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Exercise 3 2 Short Answer Questions

1. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then show that $A^2 - 4A - 5I = O$.

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2. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then show that $A^3 - 3A^2 - A - 3I = O$, where I is unit matrix of order 3

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3. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then show that $(aI + bE)^3 = a^3I + 3a^2bE$ where I is identify matrix of order 2.

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4. $\theta - \varphi = \frac{\pi}{2}$ then show that

$$\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix} \begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix} = O$$

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5. IF $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$, for any integer $n \geq 1$.

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6. Given example of two square matrices A and B of the same order for which AB=O, but $BA \neq O$.

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7. A certain book shop has 10 dozen chemistry books, 8 dozen physics books, 10 dozen economics books. Their selling prices are Rs. 80, Rs. 60, Rs. 40 each respectively. Using matrix algebra, find the total value of the books in the shop.

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8. A trust fund has to invest Rs 30,000 in two different types of bonds. The first bond pays 5% interest per year, and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs.30,000 among the two types of bonds, if the trust fund must obtain an annual total interest of (a) Rs.1800(b) Rs.2000.

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Exercise 3 3 Very Short Answer Questions

1. IF $A = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 & 0 \\ 0 & 1 & -2 \end{bmatrix}$ then find (AB')'

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2. IF $A = \begin{bmatrix} -2 & 1 \\ 5 & 0 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 0 & 2 \end{bmatrix}$ then find 2A+B' and 3B'-A.

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3. IF $A = \begin{bmatrix} -2 & 1 & 0 \\ 3 & 4 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 4 & 3 \\ -1 & 5 \end{bmatrix}$ then find A+B'.

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4. If $P = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$ then find $P + P^T$ and PP^T.

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5. IF $A = \begin{bmatrix} -1 & 2 \\ 0 & 1 \end{bmatrix}$ then find AA'. Do A and A' commute with respect to mulitplication of matrices?

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6. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is symmetric, find value of x.

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7. If $\begin{bmatrix} 0 & 4 & -2 \\ -4 & 0 & 8 \\ 2 & -8 & x \end{bmatrix}$ is a skew symmetric matrix then find the value of x.

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8. Is $\begin{bmatrix} 0 & 1 & 4 \\ -1 & 0 & 7 \\ -4 & -7 & 0 \end{bmatrix}$ symmetric or shew symmetric?

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9. For any square matrix A, show that AA' is symmetric.

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Exercise 3 3 Short Answer Questions

1. IF $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then show that AA'=A'A

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2. IF $A = \begin{bmatrix} 1 & 5 & 3 \\ 2 & 4 & 0 \\ 3 & -1 & -5 \end{bmatrix}, B = \begin{bmatrix} 2 & -1 & 0 \\ 0 & -2 & 5 \\ 1 & 2 & 0 \end{bmatrix}$ then find 3A-4B'.

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3. IF $A = \begin{bmatrix} 7 & -2 \\ -1 & 2 \\ 5 & 3 \end{bmatrix}. B = \begin{bmatrix} -2 & -1 \\ 4 & 2 \\ -1 & 0 \end{bmatrix}$ then find AB' and BA'

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Exercise 3 4 Very Short Answer Questions

1. Find the minors of -1 and 3 in the matrix $\begin{bmatrix} 2 & -1 & 4 \\ 0 & -2 & 5 \\ -3 & 1 & 3 \end{bmatrix}$

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2. Find the cofactors of 2 and -5 in the matrix $\begin{bmatrix} -1 & 0 & 5 \\ 1 & 2 & -2 \\ -4 & -5 & 3 \end{bmatrix}$

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3. Find the determinant value of the following matrices.

$\begin{bmatrix} 1 & -1 \\ -3 & 1 \end{bmatrix}$

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4. Find the determinant value of the following matrices.

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

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5. Find the determinant value of the following matrices.

$$\begin{bmatrix} 4 & 5 \\ -6 & 2 \end{bmatrix}$$

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6. Find the determinant value of the following matrices.

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

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7. Find the determinant value of the following matrices.

$$\begin{bmatrix} 1 & 2 & -3 \\ 4 & -1 & 7 \\ 2 & 4 & -6 \end{bmatrix}$$

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8. Find the determinant of the matrix

$$\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$$

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9. $\begin{vmatrix} a+b & c & c \\ b & a+c & b \\ a & a & b+c \end{vmatrix} =$

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10. Find the determinant of the matrix $\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$

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11. IF $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{bmatrix}$ and det A=45 then find x.

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12. If the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{bmatrix}$ is singular one, then λ is

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13. Show that $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} = 0$

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

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Exercise 3 4 Short Answer Questions

1. Show that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

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2. Show that $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$

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3. Show that

$|(b+c, c+a, a+b), (a+b, b+c, c+a)(a, b, c)| = a^3 + b^3 + c^3 - 3abc.$

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4. Show that $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$

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5. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

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6. $\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix} =$

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7. $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$

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8. Show that $\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = (x + 2a)(x - a)^2$

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9. Without expanding the determinant, prove that (i)

$$\begin{vmatrix} a & a^2 & bc \\ b & b^2 & ca \\ c & c^2 & ab \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$$

(ii) $\begin{vmatrix} ax & by & cz \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix} = \begin{vmatrix} a & b & c \\ x & y & z \\ yz & zx & xy \end{vmatrix}$

(iii) $\begin{vmatrix} 1 & bc & b + c \\ 1 & ca & c + a \\ 1 & ab & a + b \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$

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10. IF $\Delta_1 = \begin{vmatrix} 1 & \cos\alpha & \cos\beta \\ \cos\alpha & 1 & coy\gamma \\ \cos\beta & \cos\gamma & 1 \end{vmatrix}$, $\Delta_2 \begin{vmatrix} 0 & \cos\alpha & \cos\beta \\ \cos\alpha & 0 & \cos\gamma \\ \cos\beta & \cos\gamma & 0 \end{vmatrix}$ and $\Delta_1 = \Delta_2$ then show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$

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11. If

$$\Delta_1 = \begin{vmatrix} a_1^2 + b_1 + c_1 & a_1a_2 \begin{vmatrix} b_2 \end{vmatrix} c_2 & a_1a_3 + b_3 + c_3 \\ b_1b_2 + c_1 & b_2^2 + c_2 & b_2b_3 + c_3 \\ c_1c_3 & c_2c_3 & c_3^2 \end{vmatrix} \text{ and } \Delta_2 = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix},$$

then find the value of $\frac{\Delta_1}{\Delta_2}$.

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Exercise 3 4 Long Answer Questions

1. Show that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ =(a-b)(b-c)(c-a)

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

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3. Show that $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$ =(a-b)(b-c)(c-a)(ab+bc+ca)

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4. Show that $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^2 & b^3 & c^3 \end{vmatrix} = abc(a - b)(b - c)(c - a)$

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5. Prove that $\begin{vmatrix} y + z & x & x \\ y & z + x & y \\ z & z & x + y \end{vmatrix} = 4xyz$

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6. Show that $A = \begin{vmatrix} -2a & a + b & c + a \\ a + b & -2b & b + c \\ c + a & c + b & -2c \end{vmatrix} = 4(a + b)(b + c)(c + a)$

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Exercise 3 5 Very Short Answer Questions

1. Find the adjoint and the inverse of following matrices

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

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2. Find the Adjoint and Inverse of the matrix $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

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3. If $A = \begin{bmatrix} a + ib & c + id \\ -c + id & a - ib \end{bmatrix}$, $a^2 + b^2 + c^2 + d^2 = 1$, then find inverse of A.

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Exercise 3 5 Short Answer Questions

1. Find the adjoint and inverse of the matrix $\begin{bmatrix} 2 & 1 & 2 \\ 1 & 0 & 1 \\ 2 & 2 & 1 \end{bmatrix}$

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2. Find the adjoint and the inverse of following matrices

$\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ if $abc \neq 0$

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

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4. IF $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ then show that adj $A = 3A^T$. Also find A^{-1}.

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5. IF $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then show that $A^{-1} = A'$.

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6. IF $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ then show that $A^{-1} = A^3$.

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7. If $AB = I$ or $BA = I$, then prove that A is invertible and $B = A^{-1}$.

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8. Show that the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ is non-singular and find A^{-1}.

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9. If $S = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}, A = \frac{1}{2}\begin{bmatrix} b+c & c-a & b-a \\ c-b & c+a & a-b \\ b-c & a-c & a+b \end{bmatrix}$, then $SAS^{-1} =$

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Exercise 3 6 Very Short Answer Questions

1. The rank of $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is

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2. Find the rank of $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

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3. Find the rank of $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

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4. Find the rank of $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

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5. Find the rank of $\begin{bmatrix} 1 & 0 & -4 \\ 2 & -1 & 3 \end{bmatrix}$

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6. Find the rank of $\begin{bmatrix} 1 & 2 & 6 \\ 2 & 4 & 3 \end{bmatrix}$

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7. Find the rank of the following matrices

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

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8. Find the rank of $\begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$

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9. Find the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$

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10. Find the rank of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

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11. Find the rank of the following matrices

$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 2 & 4 \\ 0 & 0 & 1 & 2 \end{bmatrix}$

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12. Find the rank of the following matrices

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

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13. Find the rank of the following matrices using elementary transformations

(i) $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$

(ii) $\begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$

(iii) $\begin{bmatrix} -1 & -2 & -3 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix}$

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Exercise 3 7 Long Answer Questions

1. Examine whether the systems of equations given are consistent or inconsistent and if consistent find the complete solution.

$x - 4y + 7z = 8$

$3x + 8y - 2z = 6$

$7x - 8y + 26z = 31$

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2. Examine whether the systems of equations given are consistent or inconsistent and if consistent find the complete solution.

$x - 3y - 8z = -10$

$3x + y - 4z = 0$

$2x + 5y + 6z = 13$

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3. Examine whether the systems of equations given are consistent or inconsistent and if consistent find the complete solution.

$2x - y + 3z = 8$

$-x + 2y + z = 4$

$3x + y - 4z = 0$

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4. Apply the test of rank to examine whether the equations $x + y + z = 6, x - y + z = 2, 2x - y + 3z = 9$ is consistent or inconsistent and if consistent find the complete solution.

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5. Examine whether the following system of equations are consistent or inconsistent and if consistent, find the complete solution, $x + y + z = 1, 2x + y + z = 2, x + 2y + 2z = 1.$

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6. Examine the consistency of the following systems of equations $x + y + z = 9, 2x + 5y + 7z = 52, 2x + y - z = 0$ and if consistent find the complete solutions.

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7. Examine the consistency of the following systems of equations $2x + 3y + z = 9, x + 2y + 3z = 6, 3x + y + 2z = 8$ and if consistent find the complete solutions.

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8. Examine the consistency of the following systems of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + 4z = 1$ and if consistent find the complete solutions.

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Exercise 3 8 Short Answer Questions

1. Solve the following systems of homogeneous equations.

$2x + 3y - z = 0$

$x - y - 2z = 0$

$3x + y + 3z = 0$

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2. Solve the following systems of homogeneous equations.

$3x + y - 2z = 0$

$x + y + z = 0$

$x - 2y + z = 0$

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3. Solve the following systems of homogeneous equations.

$x + y - 2z = 0$

$2x + y - 3z = 0$

$5x + 4y - 9z = 0$

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4. Solve the system of homogenous equations

$x + y - z = 0, x - 2y + z = 0, 3x + 6y - 5z = 0.$

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5. Solve the following systems of homogeneous equations.

$2x + 5y + 6z = 0$

$x - 3y - 8z = 0$

$3x + y - 4z = 0$

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Exercise 3 9 Long Answer Questions

1. Solve the following system of equations.

(a) By using Cramer's rule and Matrix inversion method, when the coefficient matrix is non - singular.

(b) By using Gauss-Jordan method, also determine whether the system has unique solution, or infinite number of solutions or solution and find the solution if exist.

$2x - y + 3z = 9$

$x + y + z = 6$

$x - y + z - 2$

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2. Solve the following system of equations.

(a) By using Cramer's rule and Matrix inversion method, when the coefficient matrix is non - singular.

(b) By using Gauss-Jordan method, also determine whether the system

has unique solution, or infinite number of solutions or solution and find the solution if exist.

$x + y + z = 9$

$2x + 5y + 7z = 52$

$2x + y - z = 0$

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3. Solve the following system of equations.

(a) By using Cramer's rule and Matrix inversion method, when the coefficient matrix is non - singular.

(b) By using Gauss-Jordan method, also determine whether the system has unique solution, or infinite number of solutions or solution and find the solution if exist.

$2x + 6y + 11 = 0$

$6x + 20y - 6z + 3 = 0$

$6y - 18z + 1 = 0$

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4. Solve the following system of equations.

(a) By using Cramer's rule and Matrix inversion method, when the coefficient matrix is non - singular.

(b) By using Gauss-Jordan method, also determine whether the system has unique solution, or infinite number of solutions or solution and find the solution if exist.

$5x - 6y + 4z = 15$

$7x + 4y - 3z = 19$

$2x + y + 6z = 46$

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5. Solve the following system of equations by using Cramer's rule.

$x - y + 3z = 5, 4x + 2y - z = 0, x + 3y + z = 5.$

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6. Solve the following system of equations.

(a) By using Cramer's rule and Matrix inversion method, when the coefficient matrix is non - singular.

(b) By using Gauss-Jordan method, also determine whether the system has unique solution, or infinite number of solutions or solution and find the solution if exist.

$x + y + z = 1$

$2x + 2y + 3z = 6$

$x + 4y + 8z = 3$

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7. Solve the following system of equations.

(a) By using Cramer's rule and Matrix inversion method, when the coefficient matrix is non - singular.

(b) By using Gauss-Jordan method, also determine whether the system has unique solution, or infinite number of solutions or solution and find the solution if exist.

$x + y + 2z = 1$

$2x + y + z = 2$

$x + 2y + 2z = 1$

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8. Solve the following system of equations by using Cramer's rule.

$x - y + 3z = 5, 4x + 2y - z = 0, x + 3y + z = 5.$

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9. Solve the following system of equations by using Cramer,s ruel .

$3x + 4y + 5z = 18, 2x - y + 8z = 13, 5x - 2y + 7z = 20$

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Additional Exercise

1. $m[-3\ 4] + n[4\ -3] = [10\ -11]$ find the value of $3m + 7n$.

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2. If the trace of AB is 25 then the trace of BA is

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3. If $A = \left[a_{ij}\right]$ is a scalar matrix of order $n \times n$ such that $a_{ii} = k$ for all I then trace of $a =$

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4. If $A = \left[a_{ij}\right]_{m \times n}$ such that $a_{ij} = (i + j)^2$ then find trace of A.

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5. If $A = \left[a_{ij}\right]_{m \times n}$ and $a_{ij} = i(i + j)$ then find trace of A.

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6. Find the number of 2×2 matrices that can be formed by using 1,2,3,4 when repetition is allowed.

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7. Find the number of 2×2 matrices that can be formed by using 1,2,3,4 without repetition.

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8. If a matrix has 13 elements, then find the possible dimensions (orders) of the matrix.

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9. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then show that $A^2 - 4A - 5I = O$.

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10. The order of the matrix A is 3×5 and that of B is 2×3. The order of the matrix BA is

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11. If $\begin{bmatrix} 1 & 2 & 3 \end{bmatrix} B = \begin{bmatrix} 3 & 4 \end{bmatrix}$ then the order of the matrix B is

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12. $A = \begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix} \Rightarrow A^3 - A^2 =$

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13. If $A[\mathrm{x\ y}], B\begin{pmatrix} a & h \\ h & b \end{pmatrix}, C = \begin{pmatrix} x \\ y \end{pmatrix}$ then find ABC.

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

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15. If $A = \begin{pmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & k \end{pmatrix}$ is an idempotent matrix then find k.

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16. If $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ then A is

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17. If $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ then A is

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18. If A,B are two idempotent matrices and $AB = BA = O$ then $A + B$ is

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19. If A is a square matrix then show that $A + A^T$ and AA^T are symmetric and $A - A^T$ is skew - symmetric.

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20. If $5A = \begin{bmatrix} 3 & -4 \\ 4 & x \end{bmatrix}$ and $AA^T = A^TA = I$ then $x =$

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21. If A, B are symmetric matrices of the same order then show that $AB - BA$ is skew symmetric matrix.

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22. $A = \begin{bmatrix} 1+i & 2-3i & 4 \\ 7+2i & -i & 3-2i \end{bmatrix}$, find the conjugate of A.

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23. If $A = \begin{bmatrix} 1 & 2-3i & 3+4i \\ 2+3i & 0 & 4-5i \\ 3-4i & 4+5i & 2 \end{bmatrix}$, then show that A is hermitian matrix.

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24. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for $x \neq 0, y \neq 0$ then D is

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

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26. If A is a 3×3 matrix and $\det(3A) = k(\det A)$ then $k =$

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27. If a,b,c are different and $\begin{vmatrix} a & a^2 & a^3-1 \\ b & b^2 & b^3-1 \\ c & c^2 & c^3-1 \end{vmatrix} = 0$ then

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28. With the usual notation in ΔABC $\det \begin{vmatrix} 1 & 1 & 1 \\ \sin A & \sin B & \sin C \\ \sin^2 A & \sin^2 B & \sin^2 C \end{vmatrix}$ assumes the value

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29. If $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ then

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30. Prove that

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = \left(1+a^2+b^2\right)^3$$

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31. If $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$ then the value of $\frac{P}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}$

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32. If a,b,c, are in A.P. then $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} =$

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33. Let the three digit number A28, 3B9,62C, where A,B,C are integers between 0 and 9., be divisible by a fixed integer k. $\begin{vmatrix} A & 3 & 6 \\ 8 & 9 & C \\ 2 & B & 2 \end{vmatrix}$ is divisible

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34. 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

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35. If $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & 1 \\ a_2 & b_2 & 1 \\ a_3 & b_3 & 1 \end{vmatrix}$, then the two triangles with vertices (x_1, y_1), (x_2, y_2), (x_3, y_3) and (a_1, b_1), (a_2, b_2), (a_3, b_3) must be

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36. If a,b,c are in G.P. then find the value of $\begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix}$.

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37. If $f(x) = \begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x^2 & 2x \\ \tan x & x & 1 \end{vmatrix}$ then $Lt_{x \to 0} \frac{f'(x)}{x} =$

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38. Find the value of $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$

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39. If $a = \cos\frac{4\pi}{3} + I\sin\frac{4\pi}{3}$, then $\begin{vmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{vmatrix}$ is

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40. If $D_r = \begin{vmatrix} 2^{r-1} & 2\left(3^{r-1}\right) & 4\left(5^{4-1}\right) \\ x & y & z \\ 2^n - 1 & 3^n - 1 & 5^n - 1 \end{vmatrix}$ then $\sum_{r=1}^{n} D_r =$

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41. $Adj\begin{bmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 5 & a & -2 \\ 1 & 1 & 0 \\ -2 & -2 & b \end{bmatrix} \Rightarrow \begin{bmatrix} a & b \end{bmatrix} =$

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42. A square nonsingular matrix satisfies $A^2 - A + 2I = 0$ then $A^{-1} =$

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43. If A is 4×4 matrix and $|2A| = 64, B = \text{Adj } A$ then $|\text{Adj } B| =$

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44. The value of a third order determinan t is 11 then find the value of the square of the determinent formed by the cofactors

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45. If $\begin{vmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{vmatrix} = 64$ then $x =$

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46. If $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$ then $x = 0$

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47. If $a+b+c=0$ and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ then $x =$

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48. $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} =$

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49. Show that $\begin{vmatrix} a & c & a+c \\ a+b & b & a \\ b & b+c & c \end{vmatrix} = 4abc$

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50. Solve the system of equations $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1, \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$ by Gauss Jordan method.

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51. The cost of 3 kg rice, 4 kg wheat, 2 sugar is Rs. 130. The cost of 2kg rice, 6kg wheat, one kg sugar is Rs. 130 and the cost of 5kg rice one kg wheat, 2 kg sugar is Rs. 105. Find the cost of each item by using Gauss Jordan method.

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Algebra Of Matrices Exercise I

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

A. $\begin{pmatrix} 6 & 7 \\ 4 & 12 \end{pmatrix}$

B. $\begin{pmatrix} 2 & -1 \\ -4 & -8 \end{pmatrix}$

C. $\begin{pmatrix} 3 & -1 \\ -4 & -8 \end{pmatrix}$

D. $\begin{pmatrix} -6 & -7 \\ -4 & -12 \end{pmatrix}$

Answer: B

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2. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = J \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then $B =$

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

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

C. $I\cos\theta - B\sin\theta$

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

Answer: A

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3. If $\begin{pmatrix} x+3 & 2y+x \\ z-1 & 4a-z \end{pmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2a \end{bmatrix}$ then $x + y + z + a =$

A. -1

B. 0

C. 1

D. 8

Answer: C

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4. If $A = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 & 5 \\ 6 & 11 \end{bmatrix}$ and $3A + 5B + 2X = 0$ then X =

A. $\begin{bmatrix} 16 & -14 \\ 21 & -32 \end{bmatrix}$

B. $\begin{bmatrix} 16 & 14 \\ -21 & -32 \end{bmatrix}$

C. $\begin{bmatrix} -16 & -14 \\ -21 & -32 \end{bmatrix}$

D. $\begin{bmatrix} -16 & 14 \\ 21 & 32 \end{bmatrix}$

Answer: C

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

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

B. $-6, 4, 9$

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

D. $-6, 12, 18$

Answer: C

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6. $m\begin{bmatrix} -3 & 4 \end{bmatrix} + n\begin{bmatrix} 4 & -3 \end{bmatrix} = \begin{bmatrix} 10 & -11 \end{bmatrix} \Rightarrow 3m + 7n =$

A. 3

B. 5

C. 10

D. 1

Answer: D

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7. If $\begin{pmatrix} x-2y & 5y \\ 6 & a-2b \end{pmatrix} = 5\begin{pmatrix} 4 & 2 \\ \frac{b}{5} & 6 \end{pmatrix}$ then $a + x =$

A. 42

B. 24

C. 60

D. 66

Answer: D

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8. If $A =$ diag $(1, -1, 2) B =$ diag $(2, 3, -1)$ then $3A + 4B =$

A. diag $(11, 9, 2)$

B. diag $(11, 9, -2)$

C. diag $(11, -9, 2)$

D. diag $(11, -9, -2)$

Answer: A

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9. The additive inverse of $\begin{bmatrix} 1 & 4 & -7 \\ -3 & 2 & 5 \\ 2 & 3 & -1 \end{bmatrix}$ is

A. $\begin{bmatrix} -1 & 4 & -7 \\ -3 & -2 & -5 \\ -2 & -3 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -1 & -4 & 7 \\ 3 & -2 & -5 \\ -2 & -3 & 1 \end{bmatrix}$

C. $\begin{bmatrix} -1 & -4 & 7 \\ 3 & -2 & -5 \\ 2 & 3 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 4 & -7 \\ 3 & 2 & 5 \\ -2 & -3 & 1 \end{bmatrix}$

Answer: B

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10. The order of the matrix A is 3×5 and that of B is 2×3. The order of the matrix BA is

A. 2×3

B. 3×2

C. 2×5

D. 5×5

Answer: C

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11. If A,B are two idempotent matrices and $AB = BA = O$ then $A + B$ is

A. Scalar matrix

B. diagonam matrix

C. nilpotent matrix

D. Idempotent matrix

Answer: D

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12. If A and B are two square matrices of order n and A and B commute then for any real number k

A. $A - kI, B = kI$ are not commute

B. $A - kI, B - kI$ are commute

C. $A - kI = B - kI$

D. $A - kI, k - BI$ are commute

Answer: B

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

A. Square matrices of the same order

B. Square matrices of different order

C. Rectangular matrices of same order

D. Rectangular matrices of different order

Answer: A

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14. If $A = \begin{bmatrix} 3 & 0 \\ -4 & -1 \end{bmatrix} B = \begin{bmatrix} 3 & 5 & -7 \\ 0 & -1 & 8 \end{bmatrix} C = \begin{bmatrix} 6 \\ -1 \\ 0 \end{bmatrix}$ then $ABC =$

A. $\begin{bmatrix} 39 \\ -53 \end{bmatrix}$

B. $\begin{bmatrix} -39 \\ 53 \end{bmatrix}$

C. [39 , -53]

D. [-39, 53]

Answer: A

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15. If $\begin{pmatrix} 3 & -2 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 11 \\ -5 \end{pmatrix}$, then $3x + 7y =$

A. 0

B. 11

C. 2

D. 1

Answer: C

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16. If $A = \begin{bmatrix} 4 & 1 & 0 \\ 1 & -2 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & 0 & -1 \\ 3 & 1 & 4 \end{bmatrix}, C = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$ and $(3B - 2A)C + 2X = O$

then $X =$

A. $\frac{1}{2}\begin{bmatrix} 3 \\ 13 \end{bmatrix}$

B. $\frac{1}{2}\begin{bmatrix} 3 \\ -13 \end{bmatrix}$

C. $\frac{1}{2}\begin{bmatrix} -3 \\ 13 \end{bmatrix}$

D. $\begin{bmatrix} 3 \\ -13 \end{bmatrix}$

Answer: B

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17. If $A = \begin{pmatrix} 2 & 3 \\ 0 & 4 \end{pmatrix}$ then $A^2 - 5I =$

A. $\begin{pmatrix} -1 & 13 \\ -5 & -11 \end{pmatrix}$

B. $\begin{pmatrix} -1 & 13 \\ 5 & 11 \end{pmatrix}$

C. $\begin{pmatrix} -1 & 18 \\ 0 & 11 \end{pmatrix}$

D. $\begin{pmatrix} 1 & 13 \\ 5 & 11 \end{pmatrix}$

Answer: C

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18. If A and B are matrices such that AB = O then

A. $A = O, B \neq O$

B. $A \neq O, B = O$

C. $A = O, B = O$

D. A, B need not be null matrices

Answer: D

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19. $A = \begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix} \Rightarrow A^3 - A^2 =$

A. 2A

B. 2I

C. A

D. I

Answer: A

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20. $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then $A^3 - 4A^2 - 6A$ is equal to

A. 0

B. A

C. $-A$

D. I

Answer: C

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21. If $A = \left[a_{ij}\right]$ is scalar matrix then the trace of A is

A. $\sum ia_{ij}$

B. $\sum ia_{ij}$

C. $\sum i \sum ja_{ij}$

D. $\sum ia_{ii}$

Answer: D

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22. Find the trace of $\begin{bmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$

A. 1

B. -1

C. 3

D. 2

Answer: A

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23. If the trace of A is 7 then the trace of 7A is

A. 14

B. 28

C. 73

D. 49

Answer: D

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24. If A is a skew symmetric matrix, then trace of A is

A. 1

B. 3

C. 0

D. -1

Answer: C

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25. If $A = \left[a_{ij}\right]$ is a scalar matrix of order $n \times n$ such that $a_{ii} = k$ for all I then trace of $a =$

A. nk

B. $n + k$

C. n/k

D. n - k

Answer: A

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26. If the traces of A are 19 and B are 8 then the trace of A-B is

A. 11

B. 25

C. $\frac{17}{8}$

D. 9

Answer: A

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27. If $tr(A) = 2 + i$ then $tr((2 - i)A)$=

A. 5

B. 4

C. 3

D. -4

Answer: A

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28. If $tr(A) = 3, tr(B) = 5$ then tr(AB)=

A. 15

B. 8

C. $3/5$

D. cannot say

Answer: D

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

A. 5

B. -10

C. 10

D. 15

Answer: C

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30. If $A = \begin{bmatrix} x & 1 & 4 \\ -1 & 0 & 7 \\ -4 & -7 & 0 \end{bmatrix}$ such that $A' = -A$ then $x =$

A. -1

B. 0

C. 1

D. 4

Answer: B

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31. $P + Q = \begin{pmatrix} 2 & 3 & 5 \\ 4 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$, P is symmetric, Q is a skew symmetric matrix then

Q =

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

B. $\begin{pmatrix} 0 & \frac{1}{2} & 1 \\ -\frac{1}{2} & 0 & 0 \\ -1 & 0 & 0 \end{pmatrix}$

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

D. $\begin{pmatrix} 0 & 2 & 3 \\ -2 & 0 & 4 \\ -3 & -4 & 0 \end{pmatrix}$

Answer: A

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32. If $3A + 4B' = \begin{bmatrix} 7 & -10 & 17 \\ 0 & 6 & 31 \end{bmatrix}, 2B - 3A' = \begin{bmatrix} -1 & 18 \\ 4 & -6 \\ -5 & -7 \end{bmatrix}$ then $B =$

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

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

C. $\begin{pmatrix} 1 & 3 \\ -1 & 0 \\ 2 & 4 \end{pmatrix}$

D. $\begin{pmatrix} -1 & -3 \\ 1 & 0 \\ 2 & 4 \end{pmatrix}$

Answer: C

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33. If $A = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then

A. O

B. $-I$

C. I

D. 2I

Answer: C

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

A. $AA^T = A^TA = I$

B. $AA^T = A^TA = -I$

C. $AA^T = A^TA = 0$

D. $AA^T = A^TA = A$

Answer: A

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35. If $A = \begin{bmatrix} 2 & x-3 & x-2 \\ 3 & -2 & -1 \\ 4 & -1 & -5 \end{bmatrix}$ is a symmetric matrix then x =

A. 0

B. 3

C. 6

D. 8

Answer: C

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

A. idempotent matrix

B. involutory matrix

C. nilpotent matrix of index 2

D. nilpotent matrix of index 3

Answer: C

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37. If $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ then A is

A. Idempotent matrix

B. Involutory matrix

C. Nilpotent of index 2

D. Nipotent of index 3

Answer: A

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38. If $A = \left[a_{ij}\right]_{n\times n}$ and $a_{ij} = \text{A.M. of } \{i, j\}$ then A is

A. Triangular matrix

B. diagonal matrix

C. a symmertric matrix

D. skew symmetric matrix

Answer: C

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39. If the order of A is 4×3, the order of B is 4×5 and the order of C is 7×3 then the order of $\left(A^TB\right)^TC^T$ is

A. 7×5

B. 5×7

C. 4×7

D. 7×4

Answer: B

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40. If A is a 3×4 matrix and B is matrix such that $A^TB$and BA^T are both defined then order of B is

A. 3×4

B. 4×3

C. 3×3

D. 4×4

Answer: A

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41. If A is idempotent matrix $A + B = I$ then B is

A. Null matrix

B. Identity matrix

C. equal to B^2

D. equal to B^3

Answer: C

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42. If A is a square matrix then A - A^T is a . . . . . Matrix

A. Symmetric

B. Skew symmetric

C. Hermitian

D. Triangular

Answer: B

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43. If A, B are symmetric matrices of the same order then show that $AB - BA$ is skew symmetric matrix.

A. Symmetric matrix

B. Skew symmetric matrix

C. Diagonal matrix

D. identity matrix

Answer: B

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44. A square matrix $\left(a_{ij}\right)$ where $a_{ij} = 0$ for $i \neq j$ and $a_{ij} = k$ (constant) for $i = j$ is called

A. Unit matrix

B. Scalar matrix

C. Null matrix

D. Diagonal matrix

Answer: B

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45. If a matrix A is both symmetric and skew symmetric then A is

A. I

B. Null Matrix

C. A

D. diagonal matrix

Answer: B

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46. If B an idempotent matrix and $A = I - B$ then AB =

A. I

B. 0

C. $-I$

D. B

Answer: B

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47. Statement I : Trace of matrix is defined for square matrices only.

Statement II : Matrix addition is possible for only square matrices.

A. Only I is true

B. Only II is true

C. Both I, II are true

D. neither I nor II is true

Answer: A

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Algebra Of Matrices Exercise Ii

1. If $A = \begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$ and $a^2 + b^2 + c^2 = 1$, then $A^2 =$

A. 2A

B. A

C. 3A

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

Answer: B

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

A. 1

B. 0

C. A

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

Answer: B

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3. If $AB = A, BA = B$ then $A^2 + B^2 =$

A. $A + B$

B. A - B

C. AB

D. 0

Answer: A

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4. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ then $A^5 =$

A. 243

B. 81A

C. 243A

D. 81

Answer: B

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5. $\begin{bmatrix} x & y & z \end{bmatrix} \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} =$

A. $\left[ax^2 + by^2 + cz^2 + 2hxy + 2gxz + 2fyz\right]$

B. $\left[ax^2 + by^2 + cz^2 + hxy + gxz + fyz\right]$

C. $\left[2ax^2 + 2by^2 + 2cz^2 + hxy + gxz + fyz\right]$

D. $\left[2ax^2 + 2by^2 + 2cz^2 + 2hxy + 2gxz + 2fyz\right]$

Answer: A

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6. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} x & 1 \\ y & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$ then $(x, y) =$

A. (1,4)

B. (2,1)

C. (3,3)

D. (0,1)

Answer: A

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7. If $\alpha - \beta = (2n + 1)\frac{\pi}{2}, n\varepsilon Z$ then

$$\begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix}\begin{bmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{bmatrix} =$$

A. 0

B. I

C. 2I

D. $-I$

Answer: A

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8. If $A = \begin{bmatrix} 2 & -2 \\ 2 & 3 \end{bmatrix}$ and $A^2 - 5A + kI_2 = 0$ then k =

A. 5

B. 3

C. 10

D. 6

Answer: C

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9. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then $A^2 - (a + d)A =$

A. $bc - ad$

B. $bc + ad$

C. $ad - bc$

D. $ac - bd$

Answer: A

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10. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then show that $(aI + bE)^3 = a^3I + 3a^2bE$ where I is identify matrix of order 2.

A. $a^3I + 3a^2bE$

B. $a^3I - 3a^2bE$

C. $a^3E + 3a^2bI$

D. $a^3E - 3a^2bI$

Answer: A

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11. IF $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$, for any integer $n \geq 1$.

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

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

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

D. $\begin{pmatrix} 1+2n & -4 \\ n & 1-2n \end{pmatrix}$

Answer: D

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12. if n is a positive integer and $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ then A^n is

A. $\begin{pmatrix} 0 & 0 & a^n \\ 0 & b^n & 0 \\ c^n & 0 & 0 \end{pmatrix}$

B. $\begin{pmatrix} a^n & 0 & 0 \\ 0 & b^n & 0 \\ 0 & 0 & c^n \end{pmatrix}$

C. O

D. I

Answer: B

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13. If $A = \begin{pmatrix} \cosh\theta & \sinh\theta \\ \sinh\theta & \cosh\theta \end{pmatrix}$ and $n \in N$ then $A^n =$

A. $\begin{pmatrix} \cosh n\theta & \sinh n\theta \\ \sin n\theta & \cosh n\theta \end{pmatrix}$

B. $\begin{pmatrix} -\cosh n\theta & \sinh n\theta \\ \sin n\theta & \cosh n\theta \end{pmatrix}$

C. $\begin{pmatrix} n\cosh\theta & n\sinh\theta \\ n\sinh\theta & n\cosh\theta \end{pmatrix}$

D. Does not exist

Answer: A

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14. If $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ and $n \in N$ then $A^n =$

A. $\begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$

B. $\begin{bmatrix} 1 & n & \frac{n(n-1)}{2} \\ 0 & 1 & n \\ 0 & 0 & 1 \end{bmatrix}$

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

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

Answer: B

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15. If $A^2 = 2A - I$ then for $n \neq 2, A^n =$

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

B. $nA - I$

C. $nA - (n-2)I$

D. $nA - 2I$

Answer: A

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16. If $A = \begin{bmatrix} i & 0 & 0 \\ 0 & i & 0 \\ 0 & 0 & i \end{bmatrix}$ then for $n \in N, A^{4n+1} =$

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

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

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

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

Answer: C

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17. If $A = \begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$ then the value of $A + A^2 + A^3 + \ldots . A^n =$

A. A

B. nA

C. $(n + 1)A$

D. 0

Answer: B

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18. If $A = \begin{pmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & k \end{pmatrix}$ is an idempotent matrix then k =

A. 2

B. -2

C. 3

D. -3

Answer: D

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19. IF $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$ then find the value of k

A. 2

B. -2

C. 4

D. -3

Answer: B

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20. $A = \begin{bmatrix} 1+i & 2-3i & 4 \\ 7+2i & -i & 3-2i \end{bmatrix}$ then the conjugate of A is

A. $\begin{bmatrix} 1-i & 2+3i & 4 \\ 7-2i & i & 3+2i \end{bmatrix}$

B. $\begin{bmatrix} 1+i & 7+2i & 3-2i \\ -i & 2-3i & 4 \end{bmatrix}$

C. $\begin{bmatrix} 2+3i & 1-i & 4 \\ 7-2i & 3-2i & 1 \end{bmatrix}$

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

Answer: A

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21. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is

A. symmetric matrix

B. skew symmetric matrix

C. identity matrix

D. Diagonal matrix

Answer: B

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

A. $a = 1, b = 1$

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

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

D. $a = \sec^2\theta, b = 0$

Answer: D

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23. If $\begin{bmatrix} x & 4 & -1 \end{bmatrix}\begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 2 \\ 0 & 2 & 4 \end{bmatrix}\begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix} = 0$ then $x =$

A. $-1 + \sqrt{6}$

B. $8 \pm \sqrt{5}$

C. $-2 \pm \sqrt{10}$

D. $3 \pm \sqrt{6}$

Answer: C

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24. If $A = \left[a_{ij}\right]$ is a skew symmetric matrix of order 'n' then $\sum a_{ii} =$

A. 0

B. 1

C. -1

D. n

Answer: A

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25. The number of 2×2 matrices that can be formed by using 1,2,3,4 without repetition is

A. 24

B. 12

C. 6

D. 256

Answer: A

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26. If a matrix has 13 elements, then the possible dimensions (orders) of the matrix are

A. 1×13 or 13×1

B. 1×26 or 26×1

C. 2×13 or 13×2

D. 13×13

Answer: A

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27. Statement - I, The matrix $\begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is a nilpotent matrix

Statement - II : The matrix $\begin{bmatrix} 1 & 1 & 3 \\ 5 & 3 & 4 \\ -2 & -1 & -3 \end{bmatrix}$ is an idempotent matrix

Which of the above Statement(s) is true ?

A. only I is true

B. only II true

C. Both I & II are true

D. Neither I Nor II are true

Answer: A

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28. Statement - I If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ is an Involutory matrix then $x = 0$

Statement -II : $A = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$ and $A^2 = KI$ then $K = -1$

Which of the above Statement(s) is true ?

A. only I is true

B. only II is true

C. Both I & II are true

D. Neither I Nor II are true

Answer: C

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29. Arrange the following matrices in ascending order of value of their trace.

(A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 3 & 1 \\ 1 & -1 & 2 \\ 3 & 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 3 & 4 \\ 1 & 5 \end{bmatrix}$ (D) $\begin{bmatrix} -2 & 1 \\ 3 & 8 \end{bmatrix}$

A. A, B, C, D

B. B, A, D, C

C. B, A, C, D

D. C, D, A, B

Answer: B

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30. If A is any square matrix. Observe the following lists and matching from List - I to List - II is

List-I	List-II
$(A) A^2 = A$	(1) Orthogonal matrix
$(B) A^2 = I$	(2) Symmetric matrix
$(C) A^2 = 0$	(3) Idempotent matrix
$(D) A.\ A^T = A^T A = I$	(4) Nilpotent matrix
	(5) Involutory matrix

A.

A	B	C	D
2	5	4	1

B.

A	B	C	D
3	2	4	1

C.

A	B	C	D
3	5	4	1

D.

A	B	C	D
3	5	4	2

Answer: C

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31. Assertio (A) : If $\begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ is an idempotent matrix then $x = 0$

Reason (R) : If A is an idempotent matrix then $A^2 = A$

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

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

C. A is true R is false

D. A is false R is true

Answer: D

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32. Assertion (A) : If $A = \begin{bmatrix} x & 3 & -10 \\ -3 & y & 9 \\ 10 & -9 & z \end{bmatrix}$ is a skew symmetric matrix then Tr(A)=0

Reason (R) : If A is a skew symmetric then all the elements in a principle diagonal are equal to zero.

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

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

C. A is true R is false

D. A is false R is true

Answer: A

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33. Assertion (A) : The matrix $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ is an orthogonal matrix.

Reason (R) : If A is an orthogonal matrix then $AA^T = A^TA = I$

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

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

C. A is true R is false

D. A is false R is true

Answer: A

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34. Suppose A and B are two square matrices of same order. If A, B are symmetric matrices, then AB - BA is

A. a symmetric matrix

B. a Skew symmetric matrix

C. a Scalar matrix

D. a triangle matrix

Answer: B

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Algebra Of Matrices Practice Exercise

1. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}, B = \begin{pmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{pmatrix}, C = \begin{pmatrix} 7 & 2 & -3 \\ -3 & 2 & 7 \end{pmatrix}$ then C =

A. $3B - 2A$

B. $2A + 3B$

C. $4A + B$

D. $A + 2B$

Answer: A

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2. If $A = \begin{pmatrix} 1 & -1 \\ 0 & 1 \\ 2 & 3 \end{pmatrix}, B = \begin{pmatrix} 2 & 1 \\ 3 & 0 \\ 0 & 1 \end{pmatrix}$ and $2A - 3B + 5X = O$ then X =

A. $\begin{pmatrix} 4 & 1 \\ -2 & 9 \\ 3 & -4 \end{pmatrix}$

B. $\frac{1}{5}\begin{pmatrix} 4 & 5 \\ 9 & -2 \\ -4 & -3 \end{pmatrix}$

C. $\frac{1}{5}\begin{pmatrix} 4 & -5 \\ -2 & 9 \\ -4 & 3 \end{pmatrix}$

D. $\frac{1}{5}\begin{pmatrix} -4 & 1 \\ 9 & -2 \\ 4 & -3 \end{pmatrix}$

Answer: B

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3. If $\begin{bmatrix} 4 & 9 \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} x & y^2 \\ 3 & 0 \end{bmatrix}$ then $(x, y) =$

A. $(2, \pm 3)$

B. (2,3)

C. $(4, \pm 2)$

D. $(4, \pm 3)$

Answer: D

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4. If $\begin{bmatrix} 1 & 2 & 3 \end{bmatrix} B = \begin{bmatrix} 3 & 4 \end{bmatrix}$ then the order of the matrix B is

A. 3×1

B. 3×2

C. 2×4

D. 5×2

Answer: B

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5. Let $A = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}, B = \begin{pmatrix} 4 & -3 \\ -5 & 6 \\ 0 & 1 \end{pmatrix}$ then

A. AB exists

B. AB and BA exists

C. Neither AB nor BA exist

D. BA exists but AB does not exist

Answer: D

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6. If $A = (\text{x y}), B = \begin{pmatrix} a & h \\ h & b \end{pmatrix}, C = \begin{pmatrix} x \\ y \end{pmatrix}$ then $ABC =$

A. $[ax + hy]$

B. $\left[ax^2 + 2hxy + by^2\right]$

C. $\left[bx^2 - 2hxy + ay^2\right]$

D. $[ay + hx]$

Answer: B

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7. If $A = \begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}, B = \begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ then $AB =$

A. 0

B. I

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

D. 2I

Answer: A

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8. If $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} B = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix} C = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$ then

A. $A^2 = B^2 = C^2 = 0$

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

C. $A^2 = B^2 = C^2 = -I$

D. $A^2 = B^2 = C^2 = 2I$

Answer: C

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9. If the traces of A, B are 17 and 8 then the trace of $A + B$ is

A. 11

B. 25

C. $\frac{17}{8}$

D. -9

Answer: B

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10. If the trace of AB is 30 then the trace of BA is

A. -30

B. 15

C. 30

D. 0

Answer: C

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11. If A and B are symmetric matrices then ABA is

A. diagonal matrix

B. symmetric matrix

C. skew symmetric matrix

D. identity matrix

Answer: B

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12. If $A^TB^T = C^T$ then C =

A. AB

B. BA

C. BC

D. ABC

Answer: B

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13. If $A = \begin{bmatrix} k & 2 & 3 \\ -2 & 0 & 5 \\ -3 & -5 & 0 \end{bmatrix}$ is a skew symmetric matrix then k =

A. -1

B. 0

C. 1

D. 4

Answer: B

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14. If $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ 2 & -3 & 0 \end{bmatrix}$ then $A + A^T =$

A. $\begin{pmatrix} 0 & 2 & 0 \\ 2 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

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

C. O

D. I

Answer: A

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15. $P + Q = \begin{bmatrix} 1 & 6 \\ 7 & 2 \end{bmatrix}$, P is a symmetric, Q is a skew symmetric then P =

A. $\begin{pmatrix} 1 & \frac{-13}{2} \\ \frac{-13}{2} & 0 \end{pmatrix}$

B. $\begin{pmatrix} 1 & \frac{13}{2} \\ \frac{13}{2} & 2 \end{pmatrix}$

C. $\begin{pmatrix} 0 & \frac{13}{2} \\ \frac{13}{2} & 0 \end{pmatrix}$

D. $\begin{pmatrix} 0 & \frac{-13}{2} \\ \frac{13}{2} & 0 \end{pmatrix}$

Answer: B

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16. If $A = \begin{bmatrix} x & 3 & 2 \\ -2 & y & -7 \\ -2 & 7 & 0 \end{bmatrix}$ and $A = -A^T$ then $x + y =$

A. 2

B. -1

C. 0

D. 12

Answer: C

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17. If $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ then A is

A. Idempotent matrix

B. Involutory matrix

C. Nilpotent matrix

D. Scalar matrix

Answer: C

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18. If A is square matrix then AA^T is . . . . Matrix

A. symmetric

B. skew symmetric

C. scalar

D. Idempotent

Answer: A

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19. Let A be a square matrix. Then $A + A^T$ will be

A. symmetric matrix

B. skew symmetric

C. scalar

D. identity matrix

Answer: A

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20. If A and B are two symmetric matrices then AB + BA is

A. symmetric

B. skew symmetric

C. Diagonal matrix

D. Null matrix

Answer: A

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21. If $A = \begin{pmatrix} x & 0 & 0 \\ 0 & x & 0 \\ 0 & 0 & x \end{pmatrix}$ then $A^n = (n \in N)$

A. $x^n A$

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

C. x A

D. $-x^n A$

Answer: B

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22. If A is a symmetric matrix and $n \varepsilon N$, then A^n is

A. symmetric matrix

B. skew symmetric matrix

C. Diagonal matrix

D. identity matrix

Answer: A

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23. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then $A^{2004} =$

A. I

B. O

C. A

D. A^2

Answer: A

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

A. 3

B. 5

C. -5

D. -3

Answer: B

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25. If the matrix $A = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}$ then $A^{n+1} =$

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

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

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

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

Answer: C

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26. $\begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}^n = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if n is

A. even

B. odd

C. any natural number

D. any real number

Answer: A

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27. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and $n \in N$ then $A^n =$

A. $2^n A$

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

C. n A

D. $(n = 1)A$

Answer: B

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28. IF $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then show that for all the positive integers, $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}$

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

B. $\begin{bmatrix} \cos^n\theta & \sin^n\theta \\ (-1)^n\sin^n\theta & \cos^n\theta \end{bmatrix}$

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

D. None of these

Answer: A

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29. If $A = \begin{bmatrix} 0 & a+1 & b-2 \\ 2a-1 & 0 & c-2 \\ 2b+1 & 2+x & 0 \end{bmatrix}$ is skew symmetric then $a + b + c =$

A. 3

B. -3

C. $1/3$

D. $-1/3$

Answer: C

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30. If A is a skew symmetric matrix and n is an even positive integer then A^n is

A. symmetric matrix

B. skew symmetric matrix

C. identity matrix

D. Diagonal matrix

Answer: A

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31. $A = \left[a_{ij}\right]_{3\times 3}$ is a square matrix so that $a_{ij} = i^2 - j^2$ then A is a

A. symmetric matrix

B. orthogonal

C. involutary

D. skew symmetric

Answer: D

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32. A is a symmetric matrix or skew symmetric matrix. Then $A^2$is

A. Symmetric matrix

B. skew symmetric matrix

C. an orthogonal matrix

D. a diogonal matrix

Answer: A

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33. If $A = \text{diag}\ [1\ -1\ 2], B = \text{diag}\ [2\ 3\ -1]$ and $3A + 4B = \text{diag}\ [a\ b\ c]$ then the ascending order of a, b, c is

A. a, b, c

B. b, c, a

C. c, a, b

D. c, b, a

Answer: D

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34. Observe the following lists and matching from List - I to List - II is

List-I	List-II
$(A)\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$	(1) skew symmetric matrix
$(B)\begin{bmatrix} 2 & -5 \\ -5 & 2 \end{bmatrix}$	(2) Symmetric matrix
$(S)\begin{bmatrix} 0 & x \\ -x & 0 \end{bmatrix}$	(3) Hermitian matrix
$(D)\begin{bmatrix} 1 & 2+3i \\ 2-3i & 5 \end{bmatrix}$	(4) Involutory matrix
	(5) Idempotent matrix

A.

A	B	C	D
4	1	2	3

B.

A	B	C	D
4	2	1	3

C.

A	B	C	D
4	2	3	1

D.

A	B	C	D
4	3	1	2

Answer: B

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35. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then

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

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

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

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

Answer: A

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36. If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be always true?

A. A = B

B. AB = BA

C. either of A or B is a zero matrix

D. either of A or B is a identity matrix

Answer: B

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37. Let $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$, $a, b \varepsilon N$. Then

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

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

C. There exists exactly one B such that AB = BA

D. There exist infinitely many B's such that AB = BA

Answer: D

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38. If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then which one of the following holds for all $n \geq 1$, by the principle of mathematical induction.

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

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

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

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

Answer: A

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39. If $A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and A. adjA = A. A^T then $5a + b$ is equal to

A. 13

B. -1

C. 5

D. 4

Answer: C

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40. Let A be 3×3 matrix such $A^2 - 5A + 7I = 0$ statement 1 : $A^{-1} = \frac{1}{7}(5I - A)$

Statement 2 : The polynomial $A^3 - 2A^2 - 3A + I$ can be reduce to 5 (A-4I) then

A. both stetements are true

B. both statement are false

C. statemennt 1 is true, but statement 2 is false

D. statement 1 if false, but statement 2 true

Answer: C

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41. $A = \begin{bmatrix} -4 & -1 \\ 3 & 1 \end{bmatrix}$ then the determinant of the matrix $\left(A^{2016} - 2.A^{2-15} - A^{2014}\right)$ is

A. -175

B. 2014

C. 2016

D. -25

Answer: D

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Determinants Exercise I

1. Elements of $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 4 & 2 \\ 3 & -4 & 6 \end{bmatrix}$ with their cofactors and choose the correct answer

Element	Co factor
(I) -1	(a) -2
(II) 1	(b) 32
(III) 3	(c) 4
(IV) 6	(d) 6
	(e) -6

A. b,d,a,c

B. b, d, c,a

C. d,b,a,c

D. d,a,b,c

Answer: C

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2. Find the determinant of the matrix $\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$

A. -8

B. 9

C. 4

D. -4

Answer: A

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3. $\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix} =$

A. -1

B. 1

C. 0

D. 2

Answer: C

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4. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ then det A is equal to

A. 2

B. 3

C. 4

D. 5

Answer: A

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5. $\begin{vmatrix} x & 1 & y+z \\ y & 1 & z+x \\ z & 1 & x+y \end{vmatrix} =$

A. $1 + x + y + z$

B. $x + y + z$

C. 0

D. 1

Answer: C

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

A. 0

B. 1

C. abc

D. $ab + bc + ca$

Answer: A

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7. $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 - bc & b^2 - ca & c^2 - ab \end{vmatrix} =$

A. 0

B. 1

C. abc

D. $ab + bc + ca$

Answer: A

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8. If $x \neq 0$ and $\begin{vmatrix} 1 & x & 2x \\ 1 & 3x & 5x \\ 1 & 3 & 4 \end{vmatrix} = 0$ then x=

A. 1

B. -1

C. 2

D. -2

Answer: B

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9. If $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$ then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} =$

A. 0

B. a b c

C. $-abc$

D. 2 abc

Answer: B

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10. $\left|\left(\log e, \log e^2, \log e^3\right), \left(\log e^2, \log e^3, \log e^4\right), \left(\log e^3, \log e^4, \log e^5\right)\right| =$

A. 0

B. 1

C. 4 loge

D. 5 loge

Answer: A

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11. $\begin{vmatrix} ax & by & cz \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix} =$

A. $\begin{vmatrix} 1 & b & c \\ x & y & z \\ yz & zx & xy \end{vmatrix}$

B. $\begin{vmatrix} a & b & c \\ x & y & z \\ y & z & x \end{vmatrix}$

C. $\begin{vmatrix} ax & by & cz \\ a^2 & b^2 & x^2 \\ 1 & 1 & 1 \end{vmatrix}$

D. $\begin{vmatrix} x & y & z \\ a & b & c \\ yz & zx & xy \end{vmatrix}$

Answer: A

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12. If $\begin{pmatrix} 1 & 2 & x \\ 4 & -1 & 7 \\ 2 & 4 & -6 \end{pmatrix}$ is a singular matrix, then $x =$

A. 0

B. 1

C. -3

D. 3

Answer: C

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13. If the matrix $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is singular then $\theta =$

A. π

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

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

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

Answer: D

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14. The matrix $\begin{vmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 1 & 1 \end{vmatrix}$ is

A. non singular

B. singular

C. skew symmetric matrix

D. symmetric

Answer: B

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15. If $abc \neq 0$ and if $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$ then $\frac{a^3 + b^3 + c^3}{abc} =$

A. 3

B. -3

C. 2

D. -2

Answer: A

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Determinants Exercise Ii

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

A. 5

B. 25

C. -5

D. -25

Answer: B

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2. $\begin{vmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{vmatrix} =$

A. 1992

B. 1993

C. 1994

D. 0

Answer: D

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3. Show that $\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = (x + 2a)(x - a)^2$

A. $(x + 2a)(x - a)$

B. $(x + 2a)^2(x - a)$

C. $(x + 2a)(x - a)^2$

D. $(x + 2a)^2(x - a)^2$

Answer: C

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4. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3.$

A. 2

B. $2(a + b + c)$

C. 2 abc

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

Answer: B

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5. Prove that $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix} = 4xyz$

A. xyz

B. 4xyz

C. 2xyz

D. 3xyz

Answer: B

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6. If $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = k \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ then $k =$

A. 8

B. 2

C. 3

D. 0

Answer: B

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7. $\begin{vmatrix} a-b-c & 2b & 2c \\ 2a & b-c-a & 2c \\ 2a & 2b & c-a-b \end{vmatrix} =$

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

B. $2(a+b+c)^3$

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

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

Answer: A

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8. If $a \neq 6, b, c$ satisfy $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix} = 0$ then abc

A. $a + b + c$

B. 0

C. b^3

D. $ab + bc$

Answer: C

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9. If w is a complex cube root unity then $\begin{vmatrix} 1 & 1+w & 1+w^2 \\ 1+w & 1+w^2 & 1 \\ 1+w^2 & 1 & 1+w \end{vmatrix} =$

A. -2

B. 4

C. 0

D. 2

Answer: B

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10. If α, β, γ are the roots of $x^3 + px + q = 0$ then $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} =$

A. 0

B. p

C. q

D. $p^2 - 2q$

Answer: A

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11. $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix} =$

A. log(xyz)

B. $\log(xy + yz + zx)$

C. 0

D. $\log(x + y + z)$

Answer: C

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12. $\begin{vmatrix} 1/a & a^2 & bc \\ 1/b & b^2 & ca \\ 1/c & c^2 & ab \end{vmatrix} =$

A. 0

B. 1

C. abc

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

Answer: A

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13. Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$ If $|A|^2 = 25$ then $|\alpha|$ equals

A. 0

B. 5^2

C. 1

D. $1/5$

Answer: D

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14. If $k > 1$, and the determinant of the matrix A^2, where $A = \begin{bmatrix} k & k\alpha & \alpha \\ 0 & \alpha & k\alpha \\ 0 & 0 & k \end{bmatrix}$ is k^2 then $|\alpha| =$

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

B. k

C. k^2

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

Answer: D

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15. If $bc + ca + ab = 18$, and $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = \lambda \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ the value of λ is

A. abc

B. $a + b + c$

C. $ab + bc + ca$

D. 0

Answer: A

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16. If a,b,c are positive and not all equal then $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

A. ≤ 0

B. < 0

C. ≥ 0

D. > 0

Answer: B

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17. $\begin{vmatrix} a^2+x & ab & ac \\ ab & b^2+x & bc \\ ac & bc & c^2+x \end{vmatrix}$

A. $x+a+b+c$

B. $\left(x+a^2+b^2+c^2\right)x^2$

C. $\left(a^2+b^2+c^2+x\right)x$

D. $(a+b+c+x)x$

Answer: B

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18. Show that $A = \begin{vmatrix} -2a & a+b & c+a \\ a+b & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(a+b)(b+c)(c+a)$

A. $4(a+b)(b+c)(c+a)$

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

C. $4(a+b+c)$

D. $4(ab+bc+ca)$

Answer: A

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19. If $a+b+c=0$ and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ then $x =$

A. 0

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

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

D. $0, \pm\sqrt{\frac{3}{2}\left(a^2+b^2+c^2\right)}$

Answer: D

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20. If $\begin{vmatrix} \lambda^2 + 3\lambda & \lambda - 1 & \lambda + 3 \\ \lambda + 1 & 2 - \lambda & \lambda - 4 \\ \lambda - 3 & \lambda + 4 & 3\lambda \end{vmatrix} = p\lambda^4 + q\lambda^3 + r\lambda^3 + s\lambda + t$,then $t =$

A. 16

B. 17

C. 18

D. 19

Answer: C

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21. Let $\begin{vmatrix} x^2+x+1 & x+1 & 2x-3 \\ 3x^2-1 & x+2 & x-1 \\ x^2+5x+1 & 2x+3 & x+4 \end{vmatrix} = ax^4+bx^3+cx^2+dx+e$ be an identity in x. If a,b,c,d are known, then the value of e is

A. 29

B. 24

C. 16

D. 9

Answer: B

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22. If $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0$ then

A. a, b, c are in A.P.

B. a, b, c are in G.P.

C. a, b, c are in H.P.

D. a, c, b are in A.P.

Answer: B

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23. If a,b,c are the p^{th}, q^{th}, r^{th} terms in H.P. then $\begin{vmatrix} bc & p & 1 \\ ca & q & 1 \\ ab & r & 1 \end{vmatrix} =$

A. abc

B. pqr

C. 0

D. 1

Answer: C

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24. If $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$ then $x = 0$

A. $\frac{2}{3}, \frac{11}{3}$

B. $\frac{-2}{3}, \frac{11}{3}$

C. $\frac{2}{3}, \frac{-11}{3}$

D. $\frac{-2}{3}, \frac{-11}{3}$

Answer: A

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25. If a,b,c are different and $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ then $x =$

A. 1

B. a

C. b

D. 0

Answer: D

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26. If $x = -1$ is a root of the equation $\begin{vmatrix} 2-x & 3 & 3 \\ 3 & 4-x & 5 \\ 3 & 5 & 4-x \end{vmatrix} = 0$ then the other roots are

A. 0, 12

B. 11, 12

C. 0, 11

D. 0, 11/2

Answer: C

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27. If one of the roots of $\begin{vmatrix} 3 & 5 & x \\ 7 & x & 7 \\ x & 5 & 3 \end{vmatrix} = 0$ is -10, then the other roots are:

A. 3,7

B. 4,7

C. 3,9

D. 3,4

Answer: A

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28. If $\begin{vmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{vmatrix} = 64$ then $x =$

A. -1

B. 4

C. 3

D. 1

Answer: B

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29. If a,b,c, are in A.P. then $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} =$

A. 1

B. 0

C. -1

D. 2

Answer: B

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30. If a,b,c are pth, qth rth terms respectivelyy of a G.P then

$$\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix} =$$

A. log xyz

B. $(p-1)(q-1)(r-1)$

C. pqr

D. 0

Answer: D

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31. If $\begin{vmatrix} 0 & \sin\alpha & \sin\beta \\ \sin\alpha & 0 & \sin\gamma \\ \sin\beta & \sin\gamma & 0 \end{vmatrix} = \begin{vmatrix} 1 & \sin\alpha & \sin\beta \\ \sin\alpha & 1 & \sin\gamma \\ \sin\beta & \sin\gamma & 1 \end{vmatrix}$ then

A. $\sin\alpha.\ \sin\beta,\ \sin\gamma = 1$

B. $\sin\alpha + \sin\beta + \sin\gamma = 1$

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

D. 0

Answer: C

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32. With the usual notation in ΔABC $\det\begin{vmatrix} 1 & 1 & 1 \\ \sin A & \sin B & \sin C \\ \sin^2 A & \sin^2 B & \sin^2 C \end{vmatrix}$ assumes the value

A. $\frac{1}{8R^3}(a-b)(b-c)(c-a)$

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

C. $\frac{1}{8R}(a-b)(a-c)(b-c)$

D. $8R^3$

Answer: A

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33. If $y = \cos x, y_n = \frac{d^n(\cos x)}{dx^n}$ then $\begin{vmatrix} y_4 & y_5 & y_6 \\ y_7 & y_8 & y_9 \\ y_{10} & y_{11} & y_{12} \end{vmatrix} =$

A. $-\cos x$

B. $\cos x$

C. 0

D. 1

Answer: C

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34. If $\begin{vmatrix} \cos(A+B) & -\sin(A+B) & \cos 2B \\ \sin A & \cos A & \sin B \\ -\cos A & \sin A & \cos B \end{vmatrix} = 0$ then B =

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

B. $n\pi$

C. $(2n+1)\pi$

D. $2n\pi$

Answer: A

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35. $A = \begin{bmatrix} 1 & \cos(\beta-\alpha) & \cos(\gamma-\alpha) \\ \cos(\alpha-\beta) & 1 & \cos(\gamma-\beta) \\ \cos(\alpha-\gamma) & \cos(\beta-\gamma) & 1 \end{bmatrix} =$

A. 0

B. 1

C. - 1

D. 2

Answer: A

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36. If a,b,c are different and $\begin{vmatrix} a & a^2 & a^3 - 1 \\ b & b^2 & b^3 - 1 \\ c & c^2 & c^3 - 1 \end{vmatrix} = 0$ then

A. $a + b + c = 1$

B. $ab + bc + ca = 0$

C. $a + b + c = 0$

D. $abc = 1$

Answer: D

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37. If $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$ then the value of $\frac{P}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}$

A. 3

B. 2

C. 1

D. 0

Answer: B

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38. If A is a 3×3 matrix and $\det(3A) = k(\det A)$ then $k =$

A. 9

B. 6

C. 1

D. 27

Answer: D

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39. A and B be 3×3 martrices. Then $AB = 0$ implies

A. $A = 0$ and $B = 0$

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

C. either $|A| = 0$ or $|B| = 0$

D. $A = 0$ or $B = 0$

Answer: C

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40. If x,y,z are in A.P. then the value of $\begin{vmatrix} a+2 & a+3 & a+3x \\ a+3 & a+4 & a+2y \\ a+4 & a+5 & a+2z \end{vmatrix} =$

A. 1

B. 0

C. 2a

D. a

Answer: B

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41. $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^2 \end{vmatrix} = 0, x \neq y \neq z \Rightarrow 1 + xyz =$

A. 0

B. -1

C. 1

D. 2

Answer: A

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42. If $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ x - \pi/2 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ then $\frac{df}{dx}$ at $x = \frac{\pi}{2}$ is

A. 0

B. 2

C. $\pi/2$

D. $\pi - 6$

Answer: B

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43. If $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ then

A. $\Delta_1 = 3\left(\Delta_2\right)^2$

B. $\frac{d}{dx}\left(\Delta_1\right) = 3\Delta_2$

C. $\frac{d}{dx}\left(\Delta_1\right) = 3\Delta_2^2$

D. $\frac{d}{dx}\left(\Delta_2\right) = 3\Delta_1$

Answer: B

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44. Statment - I : $\begin{vmatrix} 0 & ab^2 & ac^2 \\ a^2b & 0 & bc^2 \\ a^2c & b^2c & 0 \end{vmatrix} = 2a^3b^3c^3$

Statment - II : $\begin{vmatrix} 2ab & a^2 & b^2 \\ a^2 & b^2 & 2ab \\ b^2 & 2ab & a^2 \end{vmatrix} = \left(a^3 + b^3\right)^2$ Which of the above

statement(s) is true ?

A. only I is true

B. only II is true

C. Both I and II re true

D. neither I II are true

Answer: A

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45. Arrange the following matrices in ascending order of their determinant values.

(A) $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ (B) $\begin{bmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{bmatrix}$

(C) $\begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$

A. C,A,B

B. B,C,A

C. C,B,A

D. B,A,C

Answer: C

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46. Match the following from List - I to List - II

List-I List-II

$(I)\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} =$ $(a)(a-b)(b-c)(c-a)$

$(II)\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} =$ $(b)(a-b)(b-c)(c-a)abc$

$(III)\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} =$ $(c)(a-b)(b-c)(c-a)(a+b+c)$

A. b,c,a

B. b,a,c

C. a,b,c

D. a,c,a

Answer: C

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47. Assertion (A) : $\begin{vmatrix} 0 & p-e & e-r \\ e-p & 0 & r-p \\ r-e & p-r & 0 \end{vmatrix} = 0$

Reason (R) : The determinant of a skew symmetric matrix of odd order is zero.

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 correct explanation of A

C. A is true R is false

D. A is false R is true

Answer: A

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48. $\begin{vmatrix} 2013^2 & 2014^2 & 2015^2 \\ 2016^2 & 2017^2 & 2018^2 \\ 2019^2 & 2020^2 & 2021^2 \end{vmatrix} =$

A. -4024

B. -216

C. 216

D. 4042

Answer: B

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49. If $a \in R$ then $\begin{vmatrix} a^2 & (a+1)^2 & (a+2)^2 \\ (a+1)^2 & (a+2)^2 & (a+3)^2 \\ (a+2)^2 & (a+3)^2 & (a+4)^2 \end{vmatrix}$ is

A. depends on a

B. independent of a

C. of degree 6

D. 0

Answer: B

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50. $\begin{vmatrix} b^2 - ab & b - c & bc - ac \\ ab - a^2 & a - b & b^2 - ab \\ bc - ac & c - a & ab - a^2 \end{vmatrix} =$

A. abc

B. $a + b + c$

C. 0

D. $ab + bc + ca$

Answer: C

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51. $A(x) = \begin{vmatrix} 1 & 2 & 3 \\ x+1 & 2x+1 & 3x+1 \\ x^2+1 & 2x^2+1 & 3x^2+1 \end{vmatrix} \Rightarrow \int_0^1 A(x)dx =$

A. 0

B. 1

C. 2

D. 4

Answer: A

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52. If a, b,c are distinct positive real numbers, then the vlaue of the determinant , $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$.

A. < 0

B. > 0

C. 0

D. ≥ 0

Answer: A

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Determinants Practice Exercise

1. The minors of 1 and 7 in the matrix $\begin{bmatrix} 1 & 4 & 2 \\ 2 & -1 & 4 \\ -3 & 7 & 6 \end{bmatrix}$ are

A. 34, 0

B. 34, - 1

C. - 34, 1

D. - 34, 0

Answer: D

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2. The co factors of 7 and 6 in the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & -1 & 7 \\ 2 & 4 & 6 \end{bmatrix}$ are

A. - 22, 0

B. 0,9

C. 0, - 9

D. - 1, - 1

Answer: C

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3. If $A\begin{bmatrix} a & b & c \\ 0 & c & b \\ 0 & 0 & b \end{bmatrix}$ then det a =

A. a

B. 0

C. abc

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

Answer: C

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4. $\begin{vmatrix} 0 & b & -c \\ -b & 0 & a \\ c & -a & 0 \end{vmatrix} =$

A. 0

B. 1

C. 2

D. 3

Answer: A

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5. $\begin{vmatrix} 0 & p-q & p-r \\ q-p & 0 & q-r \\ r-p & r-q & 0 \end{vmatrix} =$

A. pqr

B. $p+q+r$

C. 2pqr

D. 0

Answer: D

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6. $\begin{vmatrix} a-b & p-q & x-y \\ b-c & q-r & y-z \\ c-a & r-p & z-x \end{vmatrix} =$

A. 0

B. 1

C. a b c

D. x y z

Answer: A

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7. $\begin{vmatrix} x+y & 0 & 0 \\ 0 & x-y & 0 \\ 0 & 0 & x^2+y^2 \end{vmatrix} =$

A. $x^4 - y^4$

B. $x^4 + y^4$

C. $x^9 - y^8$

D. $x^6 - y^6$

Answer: A

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8. If $\begin{vmatrix} a & a & x \\ m & m & m \\ b & x & b \end{vmatrix} = 0$ then $x =$

A. a

B. b

C. a or b

D. 0

Answer: C

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9. If $\begin{vmatrix} x & 2 & 7 \\ 5 & 0 & 2 \\ 3 & -4 & 6 \end{vmatrix} = -180$ then $x =$

A. 2

B. 1

C. -2

D. -1

Answer: B

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10. If $\begin{vmatrix} 1+x & 2 & 3 \\ 1 & 2+x & 3 \\ 1 & 2 & 3+x \end{vmatrix} = 0$ then x =

A. 1

B. -1

C. -6

D. 6

Answer: C

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11. $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} =$

A. $a^2b^2c^2$

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

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

D. $3a^2b^2c^2$

Answer: B

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12. $\begin{vmatrix} x & p & q \\ p & x & q \\ p & q & x \end{vmatrix} =$

A. $(x - p)(x - q)$

B. $(x - p)(x - q)(x + p + q)$

C. $(x - p)(x + p + q)$

D. $(x - q)(x + p + q)$

Answer: B

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13. $\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix} =$

A. 0

B. $\log(xyz)$

C. $\log(6xyz)$

D. $6\log(xyz)$

Answer: A

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14. If $D_r = \begin{vmatrix} 2^{r-1} & 2\left(3^{r-1}\right) & 4\left(5^{4-1}\right) \\ x & y & z \\ 2^n - 1 & 3^n - 1 & 5^n - 1 \end{vmatrix}$ then $\sum_{r=1}^{n} D_r =$

A. 0

B. 1

C. -1

D. neither I II are true

Answer: A

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15. The determinant $\Delta = \begin{vmatrix} a & a+b & a+2b \\ a+2b & a & a+b \\ a+b & a+2b & a \end{vmatrix} =$

A. $9b^2(a+b)$

B. $9a^2(a+b)$

C. $9(a+b)^3$

D. $9ab(a+b)$

Answer: A

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16. If $\begin{vmatrix} (a^2+b^2)/c & c & c \\ a & (b^2+c^2)/a & a \\ b & b & (c^2+a^2)/b \end{vmatrix} = k(abc)$ then $k =$

A. 4

B. 3

C. 2

D. 1

Answer: A

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17. $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$

A. $(a-1)^3$

B. $(a - 1)^2$

C. $(a - 1)^4$

D. $(a - 1)$

Answer: A

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18. If $A + B + C = \pi$ then $\begin{vmatrix} \tan(A + B + C) & \tan B & \tan C \\ \tan(A + C) & 0 & \tan A \\ \tan(A + B) & -\tan A & 0 \end{vmatrix} =$

A. 1

B. -1

C. $2\tan A \tan B \tan C$

D. 0

Answer: D

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19. $\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ -10 & 12 & 2 \end{vmatrix} =$

A. 0

B. 1

C. $2\cos 2x - 2\sin 2x$

D. $\cos 2x$

Answer: A

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20. $\begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix}$ is independent of

A. β

B. α and β

C. α

D. neither α nor β

Answer: C

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21. If $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^x = \begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix}$ then x =

A. 1

B. 2

C. 3

D. $1/2$

Answer: B

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22. If $a = \cos\frac{4\pi}{3} + I\sin\frac{4\pi}{3}$, then $\begin{vmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{vmatrix}$ is

A. Purely real

B. purely Imaginary

C. Rational

D. C

Answer: B

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23. If $A + B + C = \pi$ then the value of $\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix} =$

A. 1

B. -1

C. $\sin A + \sin B + \sin C$

D. 0

Answer: D

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24. If a,b,c are different and $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ then $x =$

A. $\pm\sqrt{ab + bc - ca}$

B. $\pm\sqrt{ab - bc + ca}$

C. $+\sqrt{bc + ca + ab}$

D. 0

Answer: A

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25. Let the three digit number A28, 3B9,62C, where A,B,C are integers between 0 and 9., be divisible by a fixed integer k. $\begin{vmatrix} A & 3 & 6 \\ 8 & 9 & C \\ 2 & B & 2 \end{vmatrix}$ is divisible

A. K^2

B. $K(K+1)$

C. K

D. $K+2$

Answer: C

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26. If $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ x - \pi/2 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ then $\frac{df}{dx}$ at $x = \frac{\pi}{2}$ is

A. 2

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

C. 1

D. 8

Answer: A

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27. If a,b,c are different and $\begin{vmatrix} a & a^2 & a^3 - 1 \\ b & b^2 & b^3 - 1 \\ c & c^2 & c^3 - 1 \end{vmatrix} = 0$ then

A. $a + b + c$

B. 0

C. 1

D. -1

Answer: A

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28. Statement - I : If $\begin{vmatrix} x+1 & -3 & 4 \\ -5 & x+2 & 2 \\ 4 & 1 & x-6 \end{vmatrix} = 0$ then $x = 0$

Statement - II : If $\begin{vmatrix} 15-x & 11 & 10 \\ 11-3x & 17 & 16 \\ 7-x & 15 & 13 \end{vmatrix} = 0$ then $x = 6$

Which of the above statement(s) is true ?

A. only I is true

B. only II is true

C. Both I and II are true

D. neither I nor II are true

Answer: C

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29. If $\begin{vmatrix} 5 & -3 \\ a & 3 \end{vmatrix} = 18, \begin{vmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & b \end{vmatrix} = 45, \begin{vmatrix} 2 & 1 & 0 \\ 3 & -1 & 2 \\ -1 & 5 & c \end{vmatrix} = 3$ then the ascending order a,b,c is

A. a,b,c

B. b,c,a

C. c,a,b

D. b,a,c

Answer: C

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30. Match the following from List - I to List - II

List - I	-List - II
(I) $\begin{vmatrix} 3421 & 3422 \\ 3423 & 3424 \end{vmatrix} =$	(a) 3
(II) $\begin{vmatrix} 11 & 12 & 13 \\ 12 & 13 & 14 \\ 13 & 14 & 15 \end{vmatrix} =$	(b) 0
(III) If the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{bmatrix}$ is singular then λ is	(c) -2
(IV) if $\begin{vmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{vmatrix} = 0$, then the real value of $\frac{a}{b}$ is	(d) -1

A. c,b,a,d

B. c,b,d,a

C. b,c,a,d

D. b,c,d,a

Answer: A

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31. Assertion (A) : $\begin{vmatrix} 1 & 2 & 2 \\ 2 & 3 & 4 \\ 3 & 5 & 6 \end{vmatrix} = 0$

Reason (R) : If the elements of a column of a square matrix are k times the elements of another column then the value of the determinant of the matrix is 0.

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

B. Both A and R are true but R is not 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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32. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$ = x +iy show that x = y = 0

A. $x = 3, y = 1$

B. $x = 1, y = 3$

C. $x = 0, y = 3$

D. $x = 0, y = 0$

Answer: D

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33. If $1, \omega, \omega^2$ are the cube roots of unity then $\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix} =$

A. 0

B. 1

C. w

D. w^2

Answer: A

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34. If $a^2 + b^2 + c^2 = -2$ and $f(x) = \begin{vmatrix} 1 + a^2x & (1 + b^2)x & (1 + c^2)x \\ (1 + a^2)x & 1 + b^2x & (1 + c^2)x \\ (1 + a^2)x & (1 + b^2)x & 1 + c^2x \end{vmatrix}$

then $f(x)$ is a polynomials.

A. 2

B. 3

C. 0

D. 1

Answer: A

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35. If $a_1, a_2, \ldots\ldots\ldots\ldots, a_n, \ldots\ldots\ldots$ are in G.P and $a_i > 0$ for each i then the value of $\begin{vmatrix} \log a_n, \log a_{n+2}, \log a_{n+4} \\ \log a_{n+6}, \log a_{n+8}, \log a_{n+10} \\ \log a_{n+12}, \log a_{n+14}, \log a_{n+16} \end{vmatrix} =$

A. 0

B. 1

C. - 1

D. 2

Answer: A

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36. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for $x \neq 0, y \neq 0$ then D is

A. Divisible by y but not x

B. Divisible by neither x nor y

C. Divisible by both x and y

D. Divisible by x but not y

Answer: C

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37. Let a,b, c be such that $b(a+c) \neq 0$. If

$$\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^n c \end{vmatrix} = 0$$ then the value of n is

A. any even integer

B. any odd integer

C. any integer

D. zero

Answer: B

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38. Let P and Q be 3×3 matrices with $P \neq Q$. If $P^3 = Q^3$ and $P^2Q = Q^2P$, then determinant of $\left(P^2 + Q^2\right)$ is equal to

A. -2

B. 1

C. 0

D. -1

Answer: C

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39. $\begin{vmatrix} x^2 + x & x + 1 & x - 2 \\ 2x^2 + 3x - 1 & 3x & 3x - 3 \\ x^2 + 2x + 3 & 2x - 1 & 2x - 1 \end{vmatrix} = ax - 12$ then a =

A. 24

B. - 12

C. - 24

D. 12

Answer: A

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Inverse Of A Matrix Exercise I

1. If $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is invertible then

A. $ad - bc = 0$

B. $ad - bc \neq 0$

C. $ab - cd \neq 0$

D. $ab = cd = 0$

Answer: B

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2. The inverse of the matrix $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ is

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

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

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

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

Answer: D

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

A. sinx cos x

B. 1

C. -1

D. 2

Answer: B

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4. If $\begin{bmatrix} x & y^3 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 8 \\ 2 & 0 \end{bmatrix}$ then $\begin{bmatrix} x & y \\ 2 & 0 \end{bmatrix}^{-1} =$

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

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

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

D. $\begin{pmatrix} 0 & \frac{1}{2} \\ \frac{1}{2} & \frac{-1}{4} \end{pmatrix}$

Answer: D

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

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

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

C. $\frac{1}{10}\begin{pmatrix} 2 & 2 \\ -2 & 3 \end{pmatrix}$

D. $\frac{1}{10}\begin{pmatrix} 3 & 2 \\ -2 & 2 \end{pmatrix}$

Answer: A

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6. $Adj\begin{bmatrix}1 & 0 & 2\\ -1 & 1 & -2\\ 0 & 2 & 1\end{bmatrix} = \begin{bmatrix}5 & a & -2\\ 1 & 1 & 0\\ -2 & -2 & b\end{bmatrix} \Rightarrow \begin{bmatrix}a & b\end{bmatrix} =$

A. $[-4, 1]$

B. $[-4, -1]$

C. $[4, 1]$

D. $[4, -1]$

Answer: C

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7. If $A = \begin{pmatrix}\cos x & \sin x & 0\\ -\sin x & \cos x & 0\\ 0 & 0 & 1\end{pmatrix} = f(x)$ then $A^{-1} =$

A. $f(-x)$

B. $f(x)$

C. $-f(x)$

D. $-f(-x)$

Answer: A

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8. The matrix having the same matrix as its inverse is

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

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

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

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

Answer: A

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9. If $A = \begin{bmatrix} a + ib & c + id \\ -c + id & a - ib \end{bmatrix}$, $a^2 + b^2 + c^2 + d^2 = 1$, then find inverse of A.

A. $\begin{bmatrix} a - ib & -c - id \\ c - id & a + ib \end{bmatrix}$

B. $\begin{bmatrix} 1 + ib & c + id \\ c + id & a - ib \end{bmatrix}$

C. $\begin{bmatrix} a - ib & c - id \\ c - ib & a + ib \end{bmatrix}$

D. $\begin{bmatrix} a + ib & -c - ib \\ c - id & a + ib \end{bmatrix}$

Answer: A

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10. The inverse of $\begin{bmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$ is

A. $\begin{bmatrix} 3 & 5 & -7 \\ 2 & 3 & 76 \\ 2 & 2 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 2 & 1 \\ 5 & -3 & 10 \\ 7 & 21 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 3 & -26 \\ 3 & 1 & -11 \\ -5 & -2 & 19 \end{bmatrix}$

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

Answer: C

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11. If A is a non singular square matrix, then the false statement among the following is

A. $\text{Adj } A = |A|A^{-1}$

B. $(\text{Adj } A)^{-1} = \frac{A}{|A|}$

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

D. $\text{Adj } A = O \text{ if } A = I$

Answer: D

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12. If A is an invertible matrix of order n, then the 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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13. If A is 3×3 matrix and det $A = -2$ then $|\text{Adj } A| =$

A. -4

B. 8

C. -8

D. 4

Answer: D

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14. If a is a 3×3 matrix and $|\text{Adj } A| = 16$ then $|A| =$

A. 4

B. -4

C. ± 4

D. 8

Answer: C

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

A. 2

B. 3

C. 0

D. 1

Answer: D

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16. If $\begin{bmatrix} 0 & 1 & a \\ 1 & a & 0 \\ a & 0 & 1 \end{bmatrix}$ is invertible then $a \neq$

A. 0

B. 1

C. -1

D. 2

Answer: C

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17. If A is a nonzero square matrix of order n with $\det(I + A) \neq 0$ and $A^3 = O$ where I, O are unit and null matrices of order $n \times n$ respectively then $(I + A)^{-1} =$

A. $I - A + A^2$

B. $I + A + A^2$

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

D. $I + A$

Answer: A

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18. If $|A| \neq 0$ and (A-2I) (A-3I) = 0 then $A^{-1} =$

A. $\frac{A - 5I}{6}$

B. $\frac{5I - A}{5}$

C. $\frac{5A - I}{6}$

D. $\frac{5I - A}{6}$

Answer: D

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19. If det $\left(A_{3\times 3}\right) = 6$, then det (Adj 2A) =

A. 144

B. $3^2 \times 2^8$

C. $3^3 \times 2^4$

D. $2^2 \times 3^8$

Answer: B

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20. The inverse of a skew symmetric matrix of odd order is

A. a symmetric matrx

B. a skew symmetric matrix

C. diagonal matrix

D. does not exist

Answer: D

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21. If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ then

$$\begin{vmatrix} A_1 & A_2 & A_3 \\ B_1 & B_2 & B_3 \\ C_1 & C_2 & C_3 \end{vmatrix} = \left(A_1, A_2, A_3 \ldots . \text{ are cofactors of } a_1, a_2, a_3 \ldots . \right)$$

A. $\frac{\Delta^2}{2}$

B. 2Δ

C. Δ^2

D. Δ

Answer: C

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Inverse Of A Matrix Exercise Ii

1. If the matrix A is such that $A\begin{bmatrix} -1 & 2 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$ then $A =$

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

B. $\begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$

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

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

Answer: C

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

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

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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3. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then $(\text{Adj } A)^{-1} =$

A. I

B. A

C. 1

D. 0

Answer: B

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

$[F(x)G(x)]^{-1} =$

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

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

C. $[G(x)]\{F(x)\}$

D. $F(x).\ G(x)$

Answer: A

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5. If $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and $\text{Adj } A = A = xA^T$ then x =

A. 2

B. 3

C. -3

D. -2

Answer: B

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6. If A is a square matrix such that $A(AdjA) = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$ then det $(AdjA) =$

A. 4

B. 16

C. 64

D. 256

Answer: B

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7. Let $A = \begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$ then $|\text{Adj (Adj A)}| =$

A. 64

B. 256

C. 8

D. 6

Answer: B

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

A. $\begin{bmatrix} 6 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 0 & 6 \end{bmatrix}$

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

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

D. I

Answer: A

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9. If $A = \begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$ then $|\text{Adj } A| =$

A. 64

B. 256

C. 8

D. 6

Answer: A

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

A. $2A^T$

B. A^T

C. $3A^T$

D. $\frac{1}{2}A^T$

Answer: B

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11. If A is non - singular and $A^2 - 5A + 7I = 0$ then I =

A. $\frac{1}{7}A - \frac{5}{7}A^{-1}$

B. $\frac{1}{7}A + \frac{5}{7}A^{-1}$

C. $\frac{1}{5}A + \frac{7}{5}A^{-1}$

D. $\frac{1}{5}A - A^{-1}$

Answer: C

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12. If A is non Singular and $(A - 2I)(A - 4I) = 0$ then $\frac{1}{6}A + \frac{4}{3}A^{-1} =$

A. I

B. 0

C. 2I

D. 6I

Answer: A

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13. A square nonsingular matrix satisfies $A^2 - A + 2I = 0$ then $A^{-1} =$

A. $I - A$

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

C. $I + A$

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

Answer: B

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14. If $A \neq A^2 = I$ then $|I + A| =$

A. 1

B. -1

C. 0

D. 2

Answer: C

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15. If A is a 3×3 matrix and B is its Adjoint matrix. If the determinent of B is 64 then the determinent of A is

A. ± 6

B. ± 8

C. ± 4

D. ± 16

Answer: B

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16. If A is 4×4 matrix and $|2A| = 64$, $B = \text{Adj } A$ then $|\text{Adj } B| =$

A. 2^9

B. 2^{18}

C. 2^{36}

D. 2^6

Answer: B

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17. If $A \neq I$ is an idempotent matrix, then A is a

A. Singular matrix

B. non singular matrix

C. Symmertic

D. Skew symmetric matrix

Answer: A

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18. If A is an orthogonal matrix then $|A|$ is

A. 1

B. -1

C. ± 1

D. 0

Answer: C

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

A. 0

B. $A^2 + B^2$

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

D. $A + B$

Answer: B

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20. The value of a third order determinant is 11 then the value of the square of the determinant formed by the cofactors is

A. 121

B. $(121)^2$

C. $(121)^3$

D. $(121)^4$

Answer: B

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21. A and B are square matrices of order 3×3, A is on orthogonal matrix and B is a skew symmetric matrix,. Which of the following statements is not true

A. Numerical value of |A| is 1

B. |B| = 0

C. $|AB| + 1$

D. $|AB| = 0$

Answer: C

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22. Which of the following statements is false:

A. if |A| = 0, then |adj A| = 0

B. adjoint of a diagonal matrix of order 3×3 is a diagonal matrix

C. product of two upper triangular matrices is an upper triangular matrix

D. adj (AB) = adj (A) adj (B)

Answer: D

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23. Let A be 2×2 matrix. Statement : $adj(adjA) = A$ Statement -2: $|adjA| = |A|$

A. Statement - 1 is true, Statement -2 is true, Statement - 2 is not a correct explanation for Statement - 1

B. Statement - 1 is true, Statement -2 is false

C. Statement -1 is false, Statement - 2 is true

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

Answer: D

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24. If the product of the matrix $B = \begin{bmatrix} 2 & 6 & 4 \\ 1 & 0 & 1 \\ -1 & 1 & -1 \end{bmatrix}$ with a matrix A has inverset $C = \begin{bmatrix} -1 & 0 & 1 \\ 1 & 1 & 3 \\ 2 & 0 & 2 \end{bmatrix}$, then $A^{-1} =$

A. $\begin{bmatrix} -3 & -5 & 5 \\ 0 & 9 & 14 \\ 2 & 2 & 6 \end{bmatrix}$

B. $\begin{bmatrix} -3 & 5 & 5 \\ 0 & 0 & 9 \\ 2 & 14 & 16 \end{bmatrix}$

C. $\begin{bmatrix} -3 & -5 & -5 \\ 0 & 9 & 2 \\ 2 & 14 & 6 \end{bmatrix}$

D. $\begin{bmatrix} -3 & -3 & -5 \\ 0 & 9 & 2 \\ 2 & 14 & 16 \end{bmatrix}$

Answer: C

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25. If A is any square matrix of order 'n' Observe the following list

List-I	List-II
(A) $\lvert \text{adjA} \rvert$	(1) $\lvert A \rvert^{n-2}A$
(B) adj (adjA)	(2) $\lvert A \rvert^{n(n-1)}$,
(C) $(\text{adjA})^{-1}$	(3) $\lvert A \rvert^{(n-1)^2}$
(D) $\lvert \text{adj(adj A)} \rvert$	(4) $\lvert A \rvert^{n-1}$

Match from List - I to List - II

A.

A	B	C	D
4	5	1	3

B.

A	B	C	D
4	5	1	2

C.

A	B	C	D
4	1	5	2

D.

A	B	C	D
4	1	5	3

Answer: D

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26. Statement 1 : If A is $n \times n$ matrix then $\lvert adj(adj(adjA)) \rvert = \lvert A \rvert^{(n-1)^3}$

Statement 2 $\lvert \text{adj A} \rvert = \lvert A \rvert^n$

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

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

C. Statement - 1 is true, Statement -2 is false

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

Answer: C

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27. The element of third row second column of the inverse of $A = \begin{bmatrix} 2 & -4 & -2 \\ 4 & 6 & 2 \\ 0 & 10 & -4 \end{bmatrix}$ is

A. $-\frac{2}{58}$

B. $\frac{4}{58}$

C. $\frac{5}{58}$

D. $\frac{7}{58}$

Answer: C

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28. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 5$, then the value of

$\begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix}$ is

A. 5

B. 25

C. 125

D. 0

Answer: B

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

A. 4

B. 11

C. 5

D. 0

Answer: B

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Inverse Of A Matrix Practice Exercise

1. If $A = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{bmatrix}$ and Adj $A = \begin{bmatrix} 5 & x & -2 \\ 1 & 1 & 0 \\ -2 & -2 & y \end{bmatrix}$ then (x,y) =

A. $(-4, 1)$

B. $(4, 1)$

C. $(-4, -1)$

D. $(4, -1)$

Answer: B

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2. $A = \begin{bmatrix} 2 & 3 \\ 2 & -1 \end{bmatrix} \Rightarrow 8A^{-1} =$

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

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

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

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

Answer: B

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3. If $\begin{bmatrix} x & 1 & 1 \\ 2 & 3 & 4 \\ 1 & 1 & 1 \end{bmatrix}$ has no inverse x =

A. 0

B. -1

C. 1

D. 2

Answer: C

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4. If $A = \begin{bmatrix} 3 & 4 \\ 7 & 9 \end{bmatrix}$ and $AB = I$ then $B =$

A. $\begin{bmatrix} 9 & 4 \\ 7 & -3 \end{bmatrix}$

B. $\begin{bmatrix} -9 & 4 \\ 7 & -3 \end{bmatrix}$

C. $\begin{bmatrix} 9 & -4 \\ 7 & -3 \end{bmatrix}$

D. $\begin{bmatrix} 9 & -4 \\ 7 & -3 \end{bmatrix}$

Answer: B

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5. The inverse of $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is

A. $\begin{bmatrix} 1 & -2 & -7 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 2 & -7 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 2 & -7 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & -2 & 7 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: D

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6. The inverse of $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

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

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

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

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

Answer: B

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7. The inverse of a skew symmetric matrix. (if it exists) is

A. a symmetric matrix

B. a skew symmetric matrix

C. a diagonal matrix

D. none of these

Answer: B

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8. If $A^{-1} = \frac{1}{3}\begin{bmatrix} 1 & 4 & -2 \\ -2 & -5 & 4 \\ 1 & -2 & 1 \end{bmatrix}$ and $|A| = 3$ the Adj A =

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

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

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

D. I

Answer: C

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

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

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

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

D. all the above

Answer: D

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10. If A is a 4×4 matrix and $\det A = -2$ then det $(AdjA) =$

A. -4

B. 8

C. -8

D. 4

Answer: C

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11. If A is a 4×4 matrix and $\det(AdjA) = -27$ then $\det A =$

A. 2

B. -2

C. -3

D. 3

Answer: C

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12. Let $A = \begin{pmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{pmatrix}$. The only correct statement about the matrix A is

A. A is a zero matrix

B. $A^2 = I$

C. A^{-1} does not exist

D. A = (-1) I, where I is unit matrix

Answer: B

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13. Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$ and $(10)B = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$. If B is the inverse of matrix A, then α is

A. -2

B. 5

C. 2

D. -1

Answer: B

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Linear Equations Exercise I

1. The solution of $2x + y + z = 1, x - 2y - 3z = 1, 3x + 2y + 4z = 5$ is

A. 1,2,3

B. 1,2,-3

C. 1,-3,2

D. 1,3,2

Answer: C

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2. The solution of the system of equations whose Augmented matrix is

$$\begin{bmatrix} 1 & 2 & 3 & 6 \\ 2 & 4 & 1 & 7 \\ 3 & 2 & 9 & 14 \end{bmatrix}$$ is

A. $x = 1, y = 1, z = -1$

B. $x = -1, y = 1, z = 1$

C. $x = 1, y = -1, z = 1$

D. $x = 1, y = 1, z = 1$

Answer: D

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3. The equation $2x + y - 4z = 0, x - 2y + 3z = 0, x - y + z = 0$ have

A. Unique solution

B. no solution

C. Infinitely many solutions

D. none

Answer: C

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4. The number of nontrivial solutions of the system: $x - y + z = 0, x + 2y = 0, 2x + y + 3z = 0$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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5. The equations $x + y + z = 0, 2x - y - 3z = 0, 3x - 5y + 4z = 0$ have

A. unique solution

B. Infinitely many solutions

C. no solution

D. none

Answer: A

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6. If the system of equations $3x - 2y + z = 0, \lambda x - 14y + 15z = 0, x + 2y - 3z = 0$ have non zero solution zero $\lambda =$

A. 29

B. 26

C. 23

D. 19

Answer: A

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7. If the system of equations

$2x + 3ky + (3k + 4)z = 0, x + (k + 4)y + (4k + 2)z = 0, x + 2(k + 4)y + (3k + 4)z = 0$

has non trivial solution then K =

A. -8 or $\frac{1}{2}$

B. 8 or $-\frac{1}{2}$

C. -4 or $\frac{1}{2}$

D. 4 or $-\frac{1}{2}$

Answer: A

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8. If the system of equations $3x - 2y + z = 0, \lambda x - 14y + 15z = 0, x + 2y - 3z = 0$ have non zero solution zero $\lambda =$

A. 1

B. 3

C. 5

D. 0

Answer: C

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9. If $x^2 + y^2 + z^2 \neq 0, x = cy + bz, y = az + cx,$ and $z = bx + ay, a^2 + b^2 + c^2 + 2abc$ is equal to

A. 0

B. 1

C. 2

D. - 1

Answer: B

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10. The number of Solutions of the system of equations $2x + y - z = 7, x - 3y + 2z = 1, x + 4y - 3z = 5$ is

A. 3

B. 2

C. 1

D. 0

Answer: D

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11. For the equations $x + 2y + 3z = 1, 2x + y + 3z = 2, 5x + 5y + 9z = 4$

A. no solution

B. one solution

C. infinitely many solutions

D. none

Answer: B

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12. The equation $x - y + 2z = 4, 3x + y + 4z = 6, x + y + z = 1$ have

A. no solution

B. one solution

C. Infinitely many solutions

D. none

Answer: C

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13. The equations $x + 4y - 2z = 3, 3x + y + 5z = 7, 2x + 3y + z = 5$ have

A. Unique solution

B. no solution

C. Infinitely many solutions

D. none

Answer: B

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14. The system of equations

$2x + 6y + 11 = 0, 6y - 18z + 1 = 0, 6x + 20y - 6z + 3 = 0$

A. consistent

B. inconsistent

C. can not be determined

D. none

Answer: B

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15. If the system of equations $x + y + z = 6, x + 2y + \lambda z = 0, x + 2y + 3z = 10$ has no solution then $\lambda =$

A. 2

B. 3

C. 4

D. 5

Answer: B

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16. The system of equations $4x+y+2z=5$, $x-5y+3z=10$, $9x-3y+7z=20$ has

A. No Solution

B. Unique Solution

C. Two Solutions

D. infinite number of solutions

Answer: D

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17. The rank of $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is

A. 1

B. 2

C. 0

D. 3

Answer: A

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18. The rank of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

A. 1

B. 2

C. 0

D. 3

Answer: D

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19. The rank of $\begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{bmatrix}$ is

A. 0

B. 1

C. 2

D. 3

Answer: D

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20. Find the rank of the matrix $\begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$

A. 3

B. 2

C. 1

D. 0

Answer: A

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21. The rank of $\begin{bmatrix} 1 & 0 & -4 \\ 2 & -1 & -3 \end{bmatrix}$ is

A. 1

B. 2

C. 0

D. 3

Answer: B

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

A. 1

B. $n + 1$

C. no solution

D. n - 1

Answer: C

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23. If $A = \left[a_{ij}\right]_{m \times n}$ is a matrix of rank r then

A. $r = \min\{m, n\}$

B. $r < \min\ \{m, n\}$

C. $r \leq \ \min\{m, n\}$

D. none

Answer: C

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24. If A be a matrix of rank r. Then rank of A^T is

A. r

B. $r - 1$

C. $r + 1$

D. 0

Answer: A

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Linear Equations Exercise Ii

1. If the system of equation $ax + y + z = 0, x + by + z = 0, x + y + cz = 0, (a, b, c \neq 1)$ has non trivial solution (non -zero solution) then $\frac{1}{1 - a} + \frac{1}{1 - b} + \frac{1}{1 - c} =$

A. 1

B. - 1

C. 2

D. 2

Answer: A

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2. The system of equations $(\sin 3\theta)x - y + z = 0, (\cos 2\theta)x + 4y + 3z = 0, 2x + 7y + 7z = 0$ has non trivial solutions if

A. 2

B. -2

C. 0

D. 1

Answer: A

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3. The equation $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ have unique solution if

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

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

C. $\lambda \neq 3$

D. $\lambda \neq 0$

Answer: C

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4. The system of linear equations $x + y + z = 2, 2x + y - z = 3, 3x + 2y + kz = 4$ has a unique solution if

A. $k = 0$

B. $-2 < k < 2$

C. $-1 < k < 1$

D. $k \neq 0$

Answer: D

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5. If the system of equations $x + 2y + 3z = \lambda x, 3x + y + 2z = \lambda y, 2x + 3y + z = \lambda z$ has non trivial solution then $\lambda =$

A. 6

B. 12

C. 18

D. 16

Answer: A

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6. By eliminating a,b,c from the Homogeneous Equations $x = \frac{a}{b - c}, y = \frac{b}{c - a}, z = \frac{c}{a - b}$ where a,b,c not all zero then $xy + yz + zx =$

A. 1

B. -1

C. 2

D. 0

Answer: B

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7. The system of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ is inconsistent if

A. 3, 7

B. 3, 10

C. 7, 10

D. 10, 3

Answer: B

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8. The rank of $\begin{bmatrix} 1 & -1 & 1 & 1 \\ -1 & 1 & 1 & 2 \\ 1 & 1 & -1 & 3 \end{bmatrix}$ is

A. 4

B. 3

C. 2

D. 1

Answer: B

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9. If a,b,c are all different and the equations $ax + a^2y + \left(a^3 + 1\right)z = 0, bx + b^2y + \left(b^3 + 1\right)z = 0, cx + c^2y + \left(c^3 + 1\right)z = 0$ have a nonzero solution , then

A. -1

B. 1

C. $a + b + c$

D. 0

Answer: A

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10. The values of λ for which the system of equations $x + y - 3 = 0, (1 + \lambda)x + (2 + \lambda)y - 8 = 0, x - (1 + \lambda)y + (2 + \lambda) = 0$ is consistent are

A. $-5/3, 1$

B. $2/3, -3$

C. $-1/3, -3$

D. 0,1

Answer: A

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11. The system of equations $-2x + y + z = a, x - 2y + z = b, x + y - 2z = c$ is consistent if

A. $a + b + c = 0$

B. $a + b + c = 1$

C. $a + b + c \neq 0$

D. $a + b + c \neq 1$

Answer: A

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12. The system of equations $-2x + y + z = a, x - 2y + z = b, x + y - 2z = c$ is consistent if

A. $a + b + c = 0$

B. $a + b + c = 1$

C. $a + b + c \neq 0$

D. $a + b + c \geq 0$

Answer: C

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13. The rank of $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 1 & -1 & 4 \\ 2 & 2 & 8 \end{bmatrix}$ is

A. 1

B. 2

C. 0

D. 3

Answer: D

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14. If the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & \alpha \end{bmatrix}$ is of rank 3, then $\alpha =$

A. -5

B. 5

C. 4

D. 1

Answer: B

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15. The rank of the matrix $\begin{bmatrix} -1 & 2 & 5 \\ 2 & -4 & a-4 \\ 1 & -2 & a+1 \end{bmatrix}$ is

A. 3 if a = 6

B. 1 if $a = -6$

C. 3 if $a = 2$

D. 2 if $a = -6$

Answer: B

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16. If the system of equations $(k+1)^3x + (k+2)^3y = (k+3)^2, (k+1)x + (k+2)y + k + 3, x + y = 1$ is consistent then the value of k is

A. 2

B. -2

C. -1

D. 1

Answer: B

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17. Statement - I The soluton of the system of equations $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$ is $x = 1, y = 2, z = 3$

Statement - II : The solution of the system of equations

$x + 2y - z = 3, 3x = y + 2z = 1,$

$2x - 2y + 3z = 2$ is $x = -1, y = 4, z = 4$

Which of the above Statement(s) is true ?

A. only I is true

B. only II is true

C. Both I, II are true

D. neither I nor II are true

Answer: C

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18. Statement I : Rank of a matrix is defined for only square matrices

Statement II : Trace of a matrix is defined for square matrices only

Which of the above Statement(s) is true ?

A. only I is true

B. only II is true

C. Both I, II are true

D. neither I nor II are true

Answer: B

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19. Match the following from List - I to List - II

	List - I		List - II
I.	$\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$	(a)	0
II.	$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$	(b)	1
III.	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$	(c)	2
IV.	$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	(d)	3

A. a,b,c,d

B. b,c,a,d

C. d,a,b,c

D. c,b,a,d

Answer: D

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20. the system of equations $x + y + z = 4, 2x + 5y - 2z = 3, x + 7y - 7z = 5$ has no solution.

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 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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21. Consider the system of equations

$ax + by + cz = 2$

$bx + cy + az = 2$

$cx + ay + bz = 2$

where a,b,c are real numbers such that $a + b + c = 0$. Then the system

A. has two solutions

B. is consistant

C. has unique solution

D. has infinitely many solutions

Answer: D

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22. The equation $x - y + 2z = 4, 3x + y + 4z = 6, x + y + z = 1$ have

A. unique solution

B. Infinitely many solutions

C. no solution

D. two solutions

Answer: B

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Linear Equations Practice Exercise

1. The solution of $7x + 5y - 13z + 4 = 0, 9x + 2y + 11z = 37, 3x - y + z = 2$ is

A. $x = 1, y = 2, z = 3$

B. $x = 1, y = 3, z = 2$

C. $y = 2, y = 3, z = 1$

D. $x = 1, y = 2, z = -2$

Answer: B

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2. The equations $3x - 2y + z = 5, 6x - 4y + 2z = 10, 9x - 6y + 3z = 15$ have

A. No solution

B. one solution

C. Infinitely many solutions

D. none

Answer: C

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3. The no. of solutions of the equation $3x + 3y - z = 5, x + y = z = 3, 2x + 2y - z = 3$ is

A. 1

B. 0

C. infinite

D. none

Answer: C

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4. The system of equations $x + ky + 3z = 0, 3x + ky - 2z = 0, 2x + 3y - 4z = 0$ has a non trivial solution when $k =$

A. -33

B. $-\frac{33}{2}$

C. $\frac{33}{2}$

D. 33

Answer: C

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5. Find the rank of $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

A. 1

B. 2

C. 0

D. 3

Answer: B

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6. Find the rank of the metrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$.

A. 3

B. 2

C. 1

D. 0

Answer: B

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7. If the system of equations $x + y + z = 6, x + 2y + \lambda z = 0, x + 2y + 3z = 10$ has no solution then $\lambda =$

A. 2

B. 3

C. 4

D. 5

Answer: B

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8. The rank of $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 4 & 6 & 2 \\ 1 & 2 & 3 & 2 \end{bmatrix}$ is

A. 1

B. 2

C. 0

D. 3

Answer: B

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9. The rank of $\begin{bmatrix} -1 & 2 \\ -2 & 4 \\ 3 & 6 \end{bmatrix}$ is

A. 1

B. 2

C. 0

D. 3

Answer: B

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10. If A is a non zero column matrix of order $m \times 1$ and B is a non zero row matrix of order $1 \times n$ then the rank of AB is

A. 0

B. 1

C. $-m$

D. n

Answer: B

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11. I: The system of equations $x + y + z = 6, x - y + z = 2, 2x - y + 3z = 9$ has unique solution.

II: The system of equations $x + y + z = 3, 2x + 2y - z = 3, x + y - z = 1$ has infinitely many solutions

A. only I is true

B. only II is true

C. Both I, II are true

D. neither I nor II are true

Answer: C

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12. If the system of equations $3x - 2y + z = 0, \lambda x - 14y + 15z = 0, x + 2y - 3z = 0$ have non zero solution zero $\lambda =$

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

B. Both A and R are true and R is not 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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13. If the system of linear equations $x + 2ay + az = 0, x + 3by + bz = 0, x + 4ch + cz = 0$ has a non zero solution then a,b,c

A. are in G.P.

B. are in H.P.

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

D. are in A.P.

Answer: B

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14. The system of equations $\alpha x + y + z = \alpha - 1, x + \alpha y + z = \alpha - 1, x + y + \alpha z = \alpha - 1$ has no solution if α is

A. 1

B. not -2

C. either -2 or 1

D. -2

Answer: D

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15. The system of linear equations $x + \lambda y - z = 0$

$\lambda x - y - z = 0$ and

$x + y - \lambda z = 0$ has non trivial solutions for

A. exactly three value of λ

B. infinitely many values of λ

C. exactly one value of λ

D. exactly two values of λ

Answer: A

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