MATHS

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MATRICES

Example

1. A is a square matrix of order 3. write the value n, $|2A| = n|A|$.

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2. If $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 3 \\ -2 & 5 & 3 \end{bmatrix}$ then verify that A+A is symmetric and A-A is skew-symmetric.

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3. Show that $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ is its own inverse.

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4. Express $[[123][401][-15-2]]$ as a sum of a symmetric and a skew symmeuic matrices.

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5. If I_n is an identity matrix of order n, then k being a natural number, write the matrix I_n^k.

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6. If A is a 4×5 matrix and B is a matrix such that $A^T B$ and BA^T both are defined, then write the order of B.

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7. IF $\begin{bmatrix} 3 & 5 & 3 \\ 2 & 4 & 2 \\ \lambda & 7 & 6 \end{bmatrix}$ is a singular matrix, then write the value of λ

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8. If $\begin{bmatrix} 3 & 2 \\ 7 & x \end{bmatrix}\begin{bmatrix} 5 & -2 \\ -7 & y \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then find the value of x and y.

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9. If A is a square matrix of order 3 and $|A| = 3$,then write the matrix represented by A.Adj A.

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10. If A be an invertible-matrix, then det $\left(A^{-1}\right)$ is equal to_____.

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

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12. How many entries are there in a 3×4 matrix

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13. If $[x \quad y] + [3 \quad 4] = [2 \quad -1]$ then what are the values of x and y?

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14. Find a 2×2 matrix A such that $A + \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$.

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15. If $A = \begin{bmatrix} 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 \\ 1 & -3 & 5 & 6 \end{bmatrix}$ then what is the order of A^T.

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16. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, then find (x-y) .

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17. Solve the following matrix equation for x

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

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18. If $\begin{bmatrix} x-y & z \\ 2x-y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$ then find the value of x+y.

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19. If $\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$

then write the value if a-2b .

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20. Find the value of a if $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$.

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21. If $2\begin{bmatrix}1 & 3\\ 0 & x\end{bmatrix}+\begin{bmatrix}y & 0\\ 1 & 2\end{bmatrix}=\begin{bmatrix}5 & 6\\ 1 & 8\end{bmatrix}$ then find the value of x + y.

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22. If $\begin{bmatrix}2x & 4\end{bmatrix}\begin{bmatrix}x\\ -8\end{bmatrix}=0$ then find the positive value of x.

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23. The elements a_{ij} of a 3×3 matrix are given by $a_{ij} = \frac{1}{2}|-3i + j|$. Write the value of element a_{32}.

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24. $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$ then write the value of $(x + y + z)$.

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25. Write the order of product matrix $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} [2 \quad 3 \quad 4]$.

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26. Write the value of x-y + z from the following equation. $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$.

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27. If $\begin{bmatrix} 1 & 2 & 3 \end{bmatrix} A = \begin{bmatrix} 0 \end{bmatrix}$ then what is the order of the matrix.

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28. Find x, so that $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ x \end{bmatrix} = O$

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29. If $a_{ij} = |i - j|$ then construct $\left[a_{ij}\right]_{2 \times 3}$.

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30. Transform $\begin{bmatrix} 6 & 3 \\ 2 & 2 \end{bmatrix}$ into unit matrix.

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31. If $A_\alpha = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then prove that $A_\alpha A_\beta = A_{\alpha+\beta}$.

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32. If A is an orthogonal matrix then find |A|.

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33. IfA is annon singular matrix ofsize $3/3$ then what is adj. (adjA) ?

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34. IfAand B are two square matrices such that $B = -A^{-1}BA$ then show that $(A+B)^2 = A^2 + B^2$.

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

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36. If $x\begin{bmatrix}2\\3\end{bmatrix}+y\begin{bmatrix}-1\\1\end{bmatrix}=\begin{bmatrix}10\\5\end{bmatrix}$ then write the value of x.

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37. Find the value of y and x from the following equation

$$2\begin{bmatrix}x & 5\\7 & y-3\end{bmatrix}+\begin{bmatrix}3 & -4\\1 & 2\end{bmatrix}=\begin{bmatrix}7 & 6\\15 & 14\end{bmatrix}$$

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38. Simplify:

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

.

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39. If matrix $A=\begin{bmatrix}3 & -3\\ -3 & 3\end{bmatrix}$ and $A^2=\lambda A$ then write the value of λ.

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40. For a 2×2 matrix A = $[a_{ij}]$ whose elements are given by $a_{ij} = \frac{i}{j}$, write the value of a_{12}.

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41. If $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$ then find the matrix A.

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42. If $\begin{bmatrix} x & x-y \\ 2x+y & 7 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 8 & 7 \end{bmatrix}$ then find the value of y.

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43. If $\begin{bmatrix} y+2x & 5 \\ -x & 3 \end{bmatrix} = \begin{bmatrix} 4 & 5 \\ -2 & 3 \end{bmatrix}$ then find the value of y.

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44. If $\begin{bmatrix} 2x & 1 \\ 5 & x+2y \end{bmatrix} = \begin{bmatrix} 4 & 1 \\ 5 & 0 \end{bmatrix}$ then find the value of x+y.

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45. If $\begin{bmatrix} 2x+y & 3y \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 4 \end{bmatrix}$ then find the value of x.

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46. If $\begin{bmatrix} 1 & 3 \\ 4 & 5 \end{bmatrix} = \begin{bmatrix} 7 & 11 \\ k & 23 \end{bmatrix}$ then write the value of k.

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47. Find x from the matrix equation $\begin{bmatrix} 1 & 3 \\ 4 & 5 \end{bmatrix} \begin{bmatrix} x \\ 2 \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$.

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48. Findthe inverse ofthe matrix $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$.

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49. Verify that $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ satisfies the equation $A^2 - (a+d)A + (ad-bc)I = 0$ where I is the 2x2 unit matrix.

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50. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ then find the value of

$A^2 - 3A + 2I$

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51. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then prove that

$A^2 - 4A - 5I = 0.$

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52. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, show that for no values of α, $A^2 = B$.

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

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54. If $A = \begin{bmatrix} 1 & -2 & 2 \\ 3 & 1 & -1 \end{bmatrix}$ $B \begin{bmatrix} 2 & 4 \\ 1 & 2 \\ 3 & -1 \end{bmatrix}$ verify that $(AB)^T = B^T A^T$.

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55. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $A^k = \begin{bmatrix} 1+2k & -4k \\ k & 1-2k \end{bmatrix}, k \varepsilon N$

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56. $\begin{bmatrix} 1 & -2 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x & 2 \\ 1 & y \end{bmatrix} = \begin{bmatrix} -3 & 4 \\ -1 & 4 \end{bmatrix}$ Find x and y.

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57. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then prove that $A^2 - 5A + 7I = O$

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58. Find the inverse of the matrix $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

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59. Find x, so that $\begin{bmatrix}1 & x & 1\end{bmatrix}\begin{bmatrix}1 & 3 & 2\\ 0 & 5 & 1\\ 0 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\ 1\\ x\end{bmatrix} = O$

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60. Can the inverse of the following matrix be found? $\begin{bmatrix}0 & 0 & 2\\ 3 & 6 & 0\\ 2 & 4 & 0\end{bmatrix}$.

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61. Construct the matrix $\left[a_{ij}\right]_{2\times 3}$ where $a_{ij} = |i - j|$.

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62. If $A = \begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix}$ find AB andBA.

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63. A and Bare square matrices of order n.Their product is commutative:Prove that $A^2B = BA^2$.

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64. Find x,y if $\begin{bmatrix} 3 & 2 \\ 7 & x \end{bmatrix}\begin{bmatrix} 5 & -2 \\ -7 & y \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

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65. If $\begin{bmatrix} 4x & x-2u \\ 2u+v & 3v-2w \end{bmatrix} = \begin{bmatrix} 8 & 6 \\ 3 & 5 \end{bmatrix}$ find x,u,v,w.

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66. Construct a matrix $[a_{ij}]$ of order 2×2 where $a_{ij} = i + 2j$.

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

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68. Find the matrix which when added to $\begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$ gives $\begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$.

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69. IF $\begin{bmatrix} x_1 & x_2 \\ y_1 & y_2 \end{bmatrix} - \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$ then determine x_1, x_2, y_1, y_2.

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70. Verify that $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ satisfies the equation $A^2 - (a+d)A + (ad-bc)I = 0$ where I is the 2x2 unit matrix.

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71. Using elementary transformation find the inverse of the matrix $\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$.

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72. Using elementary operation,find the inverse of $\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$.

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73. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & -1 & 1 \\ 2 & 0 & -3 \end{bmatrix}$ then find A^{-1} and hence solve the system of equations $x - 2y + z = 0$, $-y + z = -2$ and $2x - 3z = 10$.

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74. Find the value of x,y, and z if $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfies $A^1 = A^{-1}$.

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75. Find the matrix A such that $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix}$ $A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$.

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76. Suppose $A = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$

Then find BA and use this to solve the syetm of

equations

$y + 2x = 7$

$x - y = 3$

$2x + 3y + 4z = 17$

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77. Findthe inverse ofthe matrix $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$.

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78. Matrices X and Y are such that $3X + 4Y = I$ and $X - 2Y = 2I$ where I denotes the identity $[[1, 0, 0], [0, 1, 0], [0, 01]$ matrix . Determine X.

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79. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$.

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80. Find x,y if $\begin{bmatrix} 3 & 2 \\ 7 & x \end{bmatrix}\begin{bmatrix} 5 & -2 \\ -7 & y \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

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81. If $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$ find $(AB)^{-1}$

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

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83. Verify that $(AB)^T = B^T A^T$ where $A = \begin{vmatrix} 1 & -2 & 2 \\ 3 & 1 & -1 \end{vmatrix}$ and $B = \begin{vmatrix} 2 & 4 \\ 1 & 2 \\ 3 & -2 \end{vmatrix}$.

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84. If $A = \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix}, B = \begin{bmatrix} -1 & 3 \\ -3 & 1 \end{bmatrix}$ then show that $(A+B)^2 \neq A^2 + 2AB + B^2$.

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85. There are two families A and B. There are 4 men, 6 women and 2 children in family A and 2 men, 2 women and 4 children in family B. The recommended daily amount of calories is 2400 for men, 1900 for women and 1800 for children, and 45 g of proteins for men, 55 g for women and 33 g for children. Represent the above information by matrices. Using matrices multiplication, calculate the total requirement of calories and proteins for each of the 2 families.

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86. Find the inverse of the matrix $\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

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87. solve $3x - 2y + z = 1$

$2x + y - 5z = 2$

$x - y - 2z = 3.$

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88. Examining consistency and solvability, solve the following equation by matrix method.

x-2y=3

3x+4y-z=-2

5x-3z=-1

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89. solve $x + 2y + 3z = 8$

$2x + y + z = 8$

$x + y + 2z = 6.$

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

$x + y + z = 4$

$2x - y + 3z = 1$

and $3x + 2y - z = 1$

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91. By elementary operations, find A^{-1} for the following: $A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & -1 & 1 \\ 1 & -1 & 2 \end{bmatrix}$

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92. Verify that $[AB]^T = B^T A^T$ where $A = \begin{bmatrix} 1 & 2 & 3 \\ 6 & 7 & 8 \\ 6 & -3 & 4 \end{bmatrix} B = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 2 \\ 5 & 6 & 1 \end{bmatrix}.$

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93. Determine the matrices A and B where

$$A + 2B = \begin{bmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{bmatrix}$$ and

$$2A - B = \begin{bmatrix} 2 & -1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{bmatrix}.$$

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