MATHS

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MATRICES

Problem

1. What is A+B if $A = \begin{pmatrix} 1 & 2 \\ 3 & -1 \end{pmatrix} B = \begin{pmatrix} 0 & -1 \\ -2 & 1 \end{pmatrix}$?

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2. Give an example of a unit matrix.

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3. Express $A = ((1, 2), (2, 3)$ as the sum of a symmetric and a skew symmetric matrix.

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4. If

$$\left((x_1, x_2), \left((y_1, y_2) - \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}, = \begin{pmatrix} 3 & 5 \\ 1 & 2 \end{pmatrix}\right.\right.$$

then find x_1, x_2, y_1, y_2,

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5. Construct a 2 x 3 matrix having elements defined by $a_{ij} = i - j$.

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6. Find x,y if $A = A^{'} where A = \begin{pmatrix} 5 & x \\ y & 0 \end{pmatrix}$

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7. If $A = ((3, 0, 0), (0.3, 0)(0, 0, 3)$ then find A^2.

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8. Can a matrix be constructed by taking 29 elements?

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9. Verify that $[AB]^T = B^T A^T$ where

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 2 & 3 & 0 \\ 1 & 2 & 3 \end{bmatrix}$$

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10. 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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11. A trust fund has Rs. 50,000 that is to be invested in two types of bonds .The first and

second bonds respectively pay annual interest at the rate of 5% and 6% respectively .Using matrix multiplication , determine how to invest the money in these bonds so as to get a total annual interest of Rs. 2780 .

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12. Prove that a unit matrix is its own inverse. Is the converse true ?

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13. Express as a sum of a symmetric and skew symmetric matrix. $\begin{bmatrix} 2 & -1 & 3 \\ 5 & 7 & -2 \\ 1 & 4 & 6 \end{bmatrix}$

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14. Express as a sum of a symmetric and skew symmetric matrix. $\begin{bmatrix} x & a & b \\ a & y & c \\ b & c & z \end{bmatrix}$

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15. Show that $A = ((2, -3)(3, 4))$ satisfies equation $x^2 - 6x + 17 = 0$. Hence find A^{-1}.

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16. Find the inverse of $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ using elementary operations.

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17. If $A = \begin{pmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{pmatrix}$ then prove that

$A^n = ((\cos nx, \sin nx), (-\sin nx, \cos nx)$

for all positive integers n.

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18. If $A = \begin{bmatrix} 0 & -\tan\left(\frac{\alpha}{2}\right) \\ \tan\left(\frac{\alpha}{2}\right) & 0 \end{bmatrix}$ show that

$(I + A) = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ where

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

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