



# MATHS

## BOOKS - PATHFINDER MATHS

### (BENGALI ENGLISH)

## MATRICES

### Question Bank

1. Find a square matrix A of order 2 such that,

$$A + \begin{bmatrix} 4 & -2 \\ 0 & 5 \end{bmatrix} + \begin{bmatrix} -1 & 3 \\ -9 & 6 \end{bmatrix} = \begin{bmatrix} 3 & 16 \\ 7 & 8 \end{bmatrix}$$



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2. if  $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$   $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  and  $B = \begin{bmatrix} 6 \\ 2 \\ 7 \end{bmatrix}$

.Write down the linear equation represented by  $AX = B$ .



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3. If A and B are tow matrices such that  $AB = O$ , can we deduce that either A or B is a zero matrix ? Illustrate by an example.



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4. If  $A$  and  $B$  are symmetric matrices of the same order, then show that  $AB$  is symmetric if and only if  $A$  and  $B$  commute i.e  $AB = BA$  .



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5. Find the values of  $x, y, z$  if ,

$$\begin{bmatrix} 2x + y & x - y \\ x - z & x + y + z \end{bmatrix} = \begin{bmatrix} 10 & -1 \\ 2 & 8 \end{bmatrix}$$



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6. If  $A = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$   $B = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$  find the

matrix X, such that  $2A + 3X = 5B$ .



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7. Solve the matrix equation ,

$$\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} - 3 \begin{bmatrix} x \\ 2y \end{bmatrix} = \begin{bmatrix} -2 \\ 9 \end{bmatrix}$$



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8. Assume that  $y$ ,  $w$  and  $p$  are matrices of order  $3 \times k$ ,  $n \times 3$  and  $p \times k$  respectively. Find the restrictions on  $n, p, k$  so that  $py + wy$  is defined.



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9. If  $A$  is a square matrix such that  $A^2 = A$ , then find the value of  $(1 + A)^3 - A$ .



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10. Find the inverses of  $\begin{bmatrix} 1 & 2 & 4 \\ 3 & -19 & 7 \\ 2 & 4 & 8 \end{bmatrix}$ , if exists.



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11. A and B are non-singular matrices of same order then show that  $\text{adj}(AB) = (\text{adj}B) (\text{adj}A)$



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12. If  $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ , show that  $A^2 - 5A - 14I = 0$ .



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13. If  $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$  then prove that  
 $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}, n \in N.$



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14. If  $A = [1, 3, 4], B = \begin{bmatrix} 2 & 1 \\ 3 & 7 \\ 6 & 8 \end{bmatrix}, C = \begin{bmatrix} 3 & 4 \\ 5 & 6 \\ 1 & 0 \end{bmatrix}$  verify

that  $A(B+C) = AB+AC$



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15. Express  $\begin{bmatrix} 4 & 3 & 7 \\ 6 & 5 & -8 \\ 1 & 2 & 6 \end{bmatrix}$  as the sum of a symmetric matrix and a skew symmetric matrix.



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16. If  $B, C$  are square matrices and if

$$A = B + C, \quad BC = CB, \quad C^2 = 0, \text{ then show that}$$

$$A^n = B^n + nB^{n-1}C + \frac{n(n-1)}{2}B^{n-2}C^2 + \dots + \binom{n}{k}B^{n-k}C^k + \dots + C^n$$



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17. Let  $A = \begin{bmatrix} 0 & -\tan \alpha / 2 \\ \tan \alpha / 2 & 0 \end{bmatrix}$  and  $I$ , the identity matrix of order 2.



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18. Show that  $I+A = (I+A)^{-1}$



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19. If  $A = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$   $B = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$  find the matrix  $X$ , such that  $2A + 3X = 5B$ .

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20. If  $A = \begin{bmatrix} 1 & 2 \\ -4 & 2 \end{bmatrix}$ , then verify that  $A (\text{adj}A) = (\text{adj}A)A = |A| I_2$

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21.  $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ , verify that  $A^2 - 5A - 14I = 0$ ,

hence find  $A^{-1}$



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22. Find  $A^{-1}$  if

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

solve the equations  $x + 2y - 3z = -4$ ,  $2x + 3y + 2z = 2$ ,

$3x - 3y - 4z = 11$ .



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**23.** Obtain the inverse of the following matrix using elementary operations.

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



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