MATHS

BOOKS - NAVBODH MATHS (HINGLISH)

MATRICES

1. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and X is a 2×2 matrix such that AX = I , find X.

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2. Find $(AB)^{-1}$ if $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & -2 & -3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & -1 \\ 1 & 2 \\ 1 & -2 \end{pmatrix}$

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3. Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$ by using elementary row transformations.

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4. If

$f(x) = \begin{pmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{pmatrix}$, show that $(f(x))^{-1} = f(-x)$

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5. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ by using column transformations.

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6. If $A = \begin{pmatrix} 2 & -2 \\ 4 & 3 \end{pmatrix}$ then find A^{-1} by adjoint method.

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7. Find the inverse of $\begin{pmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix}$ by the adjoint method .

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8. Solve the following equations by the reduction method :

$x + 3y = 2, 3x + 5y = 4.$

9. Solve the following equations by using reduction method :

$2x - y + z = 1, x + 2y + 3z = 8, 3x + y - 4z = 1.$

10. The cost of 4 dozen pencils, 3 dozen pens and 2 dozen erasers is Rs. 60.

The cost of 2 dozen pencils, 4 dozen pens and 6 dozen erasers is Rs. 90 whereas the cost of 6 dozen pencils, 2 dozen pens

and 3 dozen erasers is Rs. 70. Find the cost of each item per dozen by using matrices.

11. Solve the following equations by the method of inversion :

$$x + 2y = 2, 2x + 3y = 3.$$

12. Solve the following equations by the invers method :

$$x + y + z = -1, x - y + z = 2, x + y - z = 3.$$

Examples For Practice

1. find the matrix X such that $AX = B$ where $A = \begin{vmatrix} 1 & 2 \\ -1 & 3 \end{vmatrix}, B = \begin{vmatrix} 0 & 1 \\ 2 & 4 \end{vmatrix}$

2. Find the inverses of the following matrices (if they exist) :

(1)

$\begin{pmatrix} 1 & 3 \\ 2 & 7 \end{pmatrix}$
(2) $\begin{pmatrix} 2 & 1 \\ 7 & 4 \end{pmatrix}$
(3) $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$
(4) $\begin{pmatrix} 3 & -10 \\ 2 & -7 \end{pmatrix}$

3. Find the matrix X such that $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{pmatrix} X = \begin{pmatrix} 2 & 2 & -5 \\ -2 & -1 & 4 \\ 1 & 0 & -1 \end{pmatrix}.$

4. If $A = \begin{pmatrix} 3a & 2b \\ -a & b \end{pmatrix}$ and $B = \begin{pmatrix} -a & b \\ 2a & 2b \end{pmatrix}$, then find a matrix X such that XA = B.

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5. Find the inverse of each of the following matrices :

$\begin{pmatrix} 1 & 5 & 2 \\ 0 & -1 & 2 \\ 0 & 0 & 1 \end{pmatrix}$

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6. Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$ by using elementary column transformations .

7. Find the adjoints of the following matrices :

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

8. Find the inverses of the following matrices by adjoint method :

(1) $\begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$ (2) $\begin{pmatrix} 5 & 4 \\ 3 & 2 \end{pmatrix}$ (3) $\begin{pmatrix} 3 & -2 \\ 6 & 8 \end{pmatrix}$ (4) $\begin{pmatrix} 2 & -3 \\ 3 & 5 \end{pmatrix}$

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9. Find the inverse of each of the following matrices, by using adjoint method :

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

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10. If $A = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{pmatrix}$, verify that A (adj A) = $|A| \cdot I$.

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11. Solve the following equations by reduction method :

$$2x + 3y = 9, y - x = -2$$

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12. Solve the following equations by reduction method :

$x + y = 2, 3x + 2y = 5$

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13. Solve the following equations by reduction method :

$2x - y = -2, 3x + 4y = 3$

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14. Solve the following equations by inverse method :

$2x + y = 5, 3x + 5y = -3$

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15. Solve the following equations by reduction method :

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

16. The sum of three numbers is 9 . If we multiply third number by 3 and add to the second number , we get 16 . By addinig the first and the third numbers and then subtracting twice the second number from this sum , we get 6 . Use these informations and find the system of linear equations. Hence, find the three numbers using matrices.

17. The sum of three numbers is 6 . When second number is subtracted from thrice the sum of first and third numbers, we get number 10 . Four times of third number is subtracted from five times the sum of first and second numbers , the result is 3 . Using above informations , find these three numbers by matrix method .

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18. The cost of 2 books, 6 notebooks and 3 pens is Rs. 40. The cost of 3 books, 4 notebooks and 2 pens is Rs. 35 , while the cost of 5 books, 7 notebooks and 4 pens is Rs. 61. Using these informations and matrix , find the cost of one book , one notebook and one pen separately .

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19. Solve the following equations by inverse method :

$$2x + 5y = 1, \; 3x + 2y = 7$$

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20. Solve the following equations by inverse method :

$$2x + y = 5, \; 3x + 5y = \; - 3$$

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21. Using matrices, solve the following system of equations:

$$x \; - \; y + z = 4; \; 2x + y \; - \; 3z = 0; \; x + y + z = 2$$

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22. Solve the following equations by inverse method :

$$x + 3y + 3z = 12, \ x + 4y + 4z = 15, \ x + 3y + 4z = 13$$

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23. Solve the following equations by inverse method :

$$x + z = -1, \ y + z = -4, \ 4x + y + z = 0.$$

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Multiple Choice Questions

1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $A(adjA) = kI$, then the value of 'k' is

A. 2

B. -2

C. 10

D. $-10.$

Answer: B

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2. The element in the first row and third column of the inverse

of the matrix $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is

A. -2

B. 0

C. 1

D. 7

Answer: D

3. Select and write the most appropriate answer from the given alternatives in each of the following :

If A is a matrix such that A (adj A) $= \begin{pmatrix} 20 & 0 \\ 0 & 20 \end{pmatrix}$, then $|A|$ = ...

A. 400

B. 20

C. 10

D. 0

Answer: B

4. If $A = \begin{bmatrix} 2 & -3 \\ 4 & 1 \end{bmatrix}$, then adjoint of matrix A is

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

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

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

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

Answer: A

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5. Select and write the most appropriate answer from the given alternatives in each of the following :

If the matrix $\begin{pmatrix} 6 & -5 & 1 \\ 4 & 2 & -1 \\ 14 & -1 & k \end{pmatrix}$ has no inverse, then

A. k = 1

B. $k = -1$

C. $k = 0$

D. $k = 2$

Answer: A::B

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6. Select and write the most appropriate answer from the given alternatives in each of the following :

The inverse of the matrix $\begin{pmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$ is

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

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

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

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

Answer: A::B

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7. Select and write the most appropriate answer from the given alternatives in each of the following :

If $A = \begin{pmatrix} 2 & 2 \\ -3 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$, then $\left(B^{-1} \cdot A^{-1}\right)^{-1}$ is equal to

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

B. $\dfrac{1}{10}\begin{pmatrix} 2 & 2 \\ -2 & 3 \end{pmatrix}$

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

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

Answer: A::B::C

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8. Select and write the most appropriate answer from the given alternatives in each of the following :

If $A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & a & 1 \end{pmatrix}$ and $A^{-1} = \dfrac{1}{2}\begin{pmatrix} 1 & -1 & 1 \\ -8 & 6 & 2c \\ 5 & -3 & 1 \end{pmatrix}$ then

A. $a = 2, c = -\dfrac{1}{2}$

B. $a = 1, c = -1$

C. $a = -1, c = 1$

D. $a = \dfrac{1}{2}, c = \dfrac{1}{2}$.

Answer: A::B::C

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9. Select and write the most appropriate answer from the given alternatives in each of the following :

The inverse of the matrix $\begin{pmatrix} -1 & 5 \\ -3 & 2 \end{pmatrix}$ is

A. $\dfrac{1}{13}\begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix}$

B. $\dfrac{1}{13}\begin{pmatrix} -1 & 5 \\ -3 & 2 \end{pmatrix}$

C. $\dfrac{1}{13}\begin{pmatrix} -1 & -3 \\ 5 & 2 \end{pmatrix}$

D. $\dfrac{1}{13}\begin{pmatrix} 1 & 5 \\ 3 & -2 \end{pmatrix}$.

Answer: A::B::C

10. The using elementary row transformation inverse of the matrix $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ is

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

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

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

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

Answer: B

11. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then $A^6 = $ ....

A. $6A$

B. $12A$

C. $16A$

D. $32A$.

Answer: D

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12. Select and write the most appropriate answer from the given alternatives in each of the following :

If $A^{-1} = \dfrac{1}{3}\begin{pmatrix} 1 & 4 & -2 \\ -2 & -5 & 4 \\ 1 & -2 & 1 \end{pmatrix}$ and $|A| = 3$,

then (adj A) = ...

A. $\dfrac{1}{9}\begin{pmatrix} 1 & 4 & -2 \\ -2 & -5 & 4 \\ 1 & -2 & 1 \end{pmatrix}$

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

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

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

Answer: A::B::C::D

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