MATHS

BOOKS - PEARSON IIT JEE FOUNDATION

MATRICES

Example

1. If A = $\begin{bmatrix} 2 & 3 & -1 \\ 5 & 6 & 1 \end{bmatrix}$, then find (0) -A (b) 3A (c) $\frac{1}{4}A$.

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

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3. If $A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$, then find $A^{2009} + \left(A^T\right)^{2009}$

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4. If $A = \begin{pmatrix} 2 & 3 \\ 5 & 1 \end{pmatrix}, B = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and AB = -13I, then find the value of a + b - c + d.

(a) 5 (b) 3 (c) 2 (d) 1

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5. If $A = \begin{pmatrix} 3 & -6 \\ -1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 6 \\ 1 & 3 \end{pmatrix}$ are two matrices, then find AB + BA.

(a) I (b) O (c) A (d) B

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6. If $A = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$, ps = 15 and det A = 21, then find the value of qr.

(a) 6 (b) -6 (c) 5 (d) -8

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7. Find the inverse of the matrix A = $\begin{bmatrix} 2 & -4 \\ 3 & -5 \end{bmatrix}$.

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8. If $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$, then find $A^{-1} + A$.

(a) I (b) 2I (c) 3I (d) 4I

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9. If $A = \begin{bmatrix} x^2 & y \\ 5 & -4 \end{bmatrix}$ and $A = A^{-1}$, then find $\begin{bmatrix} x^3 & y+x \\ 1 & 2x^2+y \end{bmatrix}^{-1}$

(a) $\frac{1}{41}\begin{bmatrix} 8 & 1 \\ -1 & 5 \end{bmatrix}$ (b) $\frac{1}{41}\begin{bmatrix} 5 & 8 \\ 1 & -1 \end{bmatrix}$

(c) $\begin{bmatrix} 5 & 1 \\ -1 & 8 \end{bmatrix}$

(d) $\frac{1}{41}\begin{bmatrix} 5 & 1 \\ -1 & 8 \end{bmatrix}$

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10. Solve the simulteneous linear equations

2x-5y =1, 5x + 3y = 18.

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11. Solve the system of linear equations 3x + 4y = 2, 5x-3y = 13 by Cramer's method.

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Exercise Very Short Answer Type Questions

1. Who gave the name 'matrix' to a rectangular arrangement of certain numbers in some rows and columns?

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2. If $a_j = 0(i \neq j)$ and $a_{ij} = 4(i = j)$,,then the matrix $A = \left[a_{ij}\right]_{n \times n}$ is a matrix

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3. If A $= \begin{bmatrix} -1 & 0 & 0 \\ 0 & x & 0 \\ 0 & 0 & m \end{bmatrix}$ is a scalar matrix, then x + m = ____.

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4. The order of column matrix containing n rows is _____.

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5. If $P = \begin{bmatrix} 3 & 0 \\ 0 & \lambda \end{bmatrix}$ is scalar matrix then λ = ____.

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6. If $\begin{bmatrix} 4 & -3 \\ 2 & 16 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 2 & 2' \end{bmatrix}$ then t =____.

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7. If A = $\begin{pmatrix} 2 & 3 \\ 6 & 9 \end{pmatrix}$, then find |A|.

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8. The product of two matrices, i.e., AB = I, then B is called the___ of A and written as____.

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9. If $\left(A + B^T\right)^T$ is a matrix of order 4×3, then the order of matrix B is____.

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10. If $\begin{bmatrix} x & 0 \\ 0 & y \end{bmatrix} + \begin{bmatrix} -y & 4 \\ 7 & x \end{bmatrix} = \begin{bmatrix} 4 & 4 \\ 7 & 6 \end{bmatrix}$ then x = ____ and y=___.

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11. Is A $= \begin{bmatrix} 4 & 6 \\ 2 & 3 \end{bmatrix}$ singular?

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12. If A is any square matrix, then $\frac{1}{2}\left(A - A^T\right)$ is a ____matrix.

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13. If the determinant of a square matrix is non-zero, then the matrix is called a ___matrix.

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14. $(AB)^{-1}$ =____.

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15. The inverse of matrix A, if A^2 = 1, is ____.

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16. The additive inverse of $\begin{bmatrix} -1 & 3 & 4 \\ 5 & -7 & 8 \end{bmatrix}$ is ____.

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17. If $A \times \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 3 & 1 & 2 \end{bmatrix}$, then the order of A is ____.

A. 1×2

B. 2×2

C. 3×2

D. 4×2

Answer: C

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18. If the order of matrices A, B and C are $3 \times 4, 7 \times 3$ and 4×7 respectively, then the order of (AC) B is _____.

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19. Express the equations 2x-y + 6 =0 and 6x + y + 8 = 0, in the matrix equation form.

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20. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then A^{-1} = ____.

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21. If $\begin{bmatrix} 2 & -4 \\ 9 & d-3 \end{bmatrix} = 4$, then d=____.

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22. If $AB = KI$, where $K \in R$, then $A^{-1} =$

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23. If p $= \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then P^{-1} =____.

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24. The value of $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$ =___.

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25. If K is real number, then $(KA)^{-1}$ =____.

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26. The matrix $A = \begin{bmatrix} a & d \\ c & a \end{bmatrix}$ is singular then a =____.

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27. If A and B commute, then $(A+B)^2$ =___.

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28. If $|A| = 5, |B_1| = 5$ and $|B_2| = 25$, then find the values of x and y in Cramer's method.

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29. If A $= [s2]$ and $B = \begin{bmatrix} x \\ y \end{bmatrix}$ then AB = ____.

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30. The matrix obtained by multiplying each of the given matrix A with -1 is called the ___ of A and is denoted by ____.

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Exercise Short Answer Type Questions

1. $If A = [a_{ij}]_{2\times 2}$ such that $a_{ij} = i - j + 3$,then find A.

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

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3. If $\begin{pmatrix} \frac{1}{2} & -\frac{3}{5} \\ \frac{4}{6} & -\frac{1}{7} \end{pmatrix} = \begin{pmatrix} -a & b \\ c & -d \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ then find a, b,c and d.

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4. If $B = \begin{bmatrix} -1 & 0 \\ 2 & 4 \end{bmatrix}$ and $f(x) = x^2 - 4x + 5,$ then find f(B).

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

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6. If $A \times \begin{bmatrix} -3 & 4 \\ 5 & 10 \end{bmatrix} = [13 \quad 6]$, then find A.

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7. Two friends Jack and Jill attend IIT entrance test which has three sections, Mathematics, Physics and Chemistry.Each question in Mathematics, Physics and Chemistry carry 5 marks, 8 marks and 3 marks respectively. Jack attempted 10 questions in Mathematics, 12 in Physics and 6 in Chemistry while Jill attemped 18, 5 and 9 questions in Mathematics, Physics and Chemistry respectively Assuming that all the questions attempted were correct, find the individual marks obtained by the boys by showing the above information as a matrix product.

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8. If A and B are two matrices such that A + B = $\begin{bmatrix} 3 & 8 \\ 11 & 6 \end{bmatrix}$ and $A - B =$ [{:(5, 2),(-3, -6):}]`, then find the matrices A and B.

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9. Compare the product ,

$$\begin{pmatrix} -5 & 1 \\ 6 & -1 \\ -2 & 0 \end{pmatrix} \begin{pmatrix} 4 & -5 & -1 \\ 5 & 6 & 1 \end{pmatrix} \begin{pmatrix} 5 \\ -4 \\ 1 \end{pmatrix}$$

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10. If $A = \begin{pmatrix} 7 & 2 \\ 18 & 5 \end{pmatrix}$, then show that $A - A^{-1} = 12I$.

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11. If $A = \begin{pmatrix} 9 & -7 \\ -4 & 3 \end{pmatrix}$ and $\mathrm{B} = \begin{pmatrix} -3 & -7 \\ -4 & -9 \end{pmatrix}$, then find AB and hence find A^{-1}.

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12. Given $A = \begin{pmatrix} 3 & P \\ 2 & 5 \end{pmatrix}$ and $\mathrm{B} = \begin{pmatrix} 1 & 0 \\ 5 & 6 \end{pmatrix}$. If AB= BA, then find p.

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13. If $A = \begin{bmatrix} 2 & -5 \\ 0 & 1 \end{bmatrix}$ and $\mathrm{I} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then find the matrix X such that 4A-2X + I = O.

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14. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}, B = \begin{bmatrix} -5 & 9 \\ 3 & 4 \end{bmatrix}$, and $\mathrm{C} = \begin{bmatrix} -3 & 6 \\ 2 & 1 \end{bmatrix}$, then find 2A + 3B - 4C.

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15. Find the possible orders for matrices A and B if they have 18 and 19 elements respectively.

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Essay Type Questions

1. If $A = \begin{pmatrix} 4 & 3 \\ -2 & 1 \end{pmatrix}$, then find $A + 10A^{-1}$,

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2. Solve the following simultaneous equations using Cramer's method:

$\frac{3x - 5y}{18} = 1, 2y - 4x + 10 = 0.$

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3. If A = $\begin{pmatrix} 2 & 7 \\ 1 & 4 \end{pmatrix}$ and $\mathrm{B} = \begin{pmatrix} 5 & -7 \\ -2 & 3 \end{pmatrix}$ find AB, $(AB)^{-1}$, A^{-1}, B^{-1} and $B^{-1}A^{1}$. What do you notice?

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4. Solve the following system of linear equations using matrix inversion method:

5x-3y = -13, 2x+ 5y = 1.

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5. If $A = \begin{pmatrix} 4 & -3 \\ 5 & 2 \end{pmatrix}$, then show that $A + 23A^{-1} = 61$.

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Exercise Concept Application Level 1

1. If $\begin{vmatrix} 2 & -3 \\ p-4 & 2p-1 \end{vmatrix} = -6$, then p =____.

A. $\frac{8}{7}$

B. $\frac{7}{8}$

C. 5

D. 0

Answer: A

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2. If $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} a & b+c \\ b-c & d \end{pmatrix} = \begin{pmatrix} 4 & -5 \\ 3 & 2 \end{pmatrix}$, then (a-b) + (c-d)=____.

A. -2

B. 9

C. 2

D. -1

Answer: D

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3. If $\begin{vmatrix} 5 & -3 \\ 6 & -a \end{vmatrix} = 4$, then 5a-4 =_____.

A. 0

B. 10

C. 14

D. $\frac{14}{5}$

Answer: B

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4. If $\begin{bmatrix} 2 & -3 \\ 5x+4 & 4 \end{bmatrix}$ has a multiplicative inverse, then x cannot be_____.

A. $\frac{3}{4}$

B. $\frac{4}{5}$

C. $\frac{-3}{4}$

D. $\frac{-4}{3}$

Answer: D

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5. If $A = \begin{bmatrix} 8 & 7 \\ -9 & -8 \end{bmatrix}$, then A^{-1}=_____.

A. A

B. $-A$

C. 2A

D. $\begin{bmatrix} 8 & 7 \\ -(-9) & -8 \end{bmatrix}$

Answer: A

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6. Given $A = \begin{bmatrix} 4 & -2 \\ 2a-1 & 5a-3 \end{bmatrix}$ and if A does not have multiplicative inverse, then 12a-13=____.

A. 6

B. $\frac{7}{12}$

C. $\frac{12}{7}$

D. -6

Answer: D

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7. If $A = \begin{pmatrix} 7 & 2 \\ -3 & 9 \end{pmatrix}, B = \begin{pmatrix} p & 2 \\ -3 & 5 \end{pmatrix}$ and AB = BA, then find p.

A. -2

B. 1

C. 3

D. p does not have a unique value

Answer: C

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8. Given $A = \begin{pmatrix} 5 & -3 \\ -2 & 1 \end{pmatrix}$, then A^{-1} =_____.

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

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

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

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

Answer: B

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9. If $\begin{vmatrix} 7a - 5b & 3c \\ -1 & 2 \end{vmatrix} = 0$, then which of the following in true?

A. 14a + 3c = 5b

B. 14a - 3c = 5b

C. 14a + 3c = 10b

D. 14a + 10 b = 3c

Answer: C

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10. If a square matrxi A is skew-symmetric, then which of the following is correct?

A. A^T is skew-symmetric

B. A^{-1} is skew-symmetric

C. A^{2007} is skew-symmetric

D. All of these

Answer: D

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11. If $|A| = 47$, then find $\left|A^T\right|$.

A. -47

B. 47

C. 0

D. 1

Answer: B

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12. There are 25 software engineers and 10 testers in Infosys and 15 software engineers and 8 testers in Wipro. In both the companies, a software engineer is paid Rs. 5000 per month and a tester is paid Rs 3000 per month. Find the total amount paid by each of the companies per month by representing the data in matrix form.

A. $\begin{pmatrix} 155000 \\ 99000 \end{pmatrix}$

B. $\begin{pmatrix} 23000 \\ 24000 \end{pmatrix}$

C. $\begin{pmatrix} 50000 \\ 30000 \end{pmatrix}$

D. $\begin{pmatrix} 155000 \\ 100000 \end{pmatrix}$

Answer: A

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13. If det (A) = 5, then find det (15A) where A is of order 2×2

A. 225

B. 75

C. 375

D. 1125

Answer: D

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14. If $A = \begin{bmatrix} \text{cosec}\alpha & \tan\alpha \\ \cot\alpha & -\sin\alpha \end{bmatrix}$, then A is a/an____.

A. singular matrix

B. scalar matrix

C. symmetric matrix

D. non-singular matrix

Answer: D

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15. Which of the following statements is true?

A. A singular matrix has an inverse.

B. If a matrix does not have multiplicative inverse, it need not be a singular matrix.

C. If a, b are non-zero real numbers, then $\begin{bmatrix} a+b & a-b \\ b-a & a+b \end{bmatrix}$ is a non-singular matrix.

D. $\begin{bmatrix} 5 & 2 \\ 3 & -1 \end{bmatrix}$ is a singular matrix.

Answer: C

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16. What is the condition that is to be satisfied for the identify (P +Q) (P-Q) = $P^2 - Q^2$ to be true for any two square matrices P and Q?

A. The identity is always true.

B. $PQ \neq QP$.

C. Both PQ and QP are not null matrices.

D. P, Q and PQ are symmetric.

Answer: D

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17. Solve the simultaneous equations:

2x-3y = 11 and 5x + 4y =16

A. $x = 5, y = -\frac{1}{3}$

B. $x = 2, y = \frac{2}{3}$

C. x=-1, y = 4

D. $x = 4, y = -1$

Answer: D

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18. If is a 2×2 identity matrix, then $\left|(3I)^{30}\right|^{-1}$ =_____.

A. $\frac{1}{3^{30}}$

B. $\frac{1}{3^{60}}$

C. 3^{30}

D. 3^{60}

Answer: B

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19. If A is 2×2 square matrix, such that det A = 9, then det (9A) =_____.

A. $\frac{1}{3^{30}}$

B. 9

C. 81

D. 729

Answer: D

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20. Which of the following statement (s) is true?

A. Inverse of a square matrix is not unique.

B. If A and B are two square matrices, then $(AB)^T = A^T B^T$.

C. If A and B are two square matrices, then $(AB)^{-1} = A^{-1}B^{-1}$.

D. If A is a non-singular square matrix, then its inverse can be uniquely expressed as sum of a symmetric and skew-symmetric matrix.

Answer: D

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21. If A and B are two square matices such that AB= A and BA = B, then find $\left(A^{2006}B^{2006}\right)^{-1}$.

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

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

C. AB

D. Cannot be determined

Answer: B

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22. If $A = \begin{bmatrix} 3 & 4 \\ -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix}$, then find the determinant of AB.

A. 10

B. 20

C. 12

D. 15

Answer: B

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23. If the trace of the matrix A is 4 and the trace of matrix B is 7, the find trace of the matrix AB.

A. 4

B. 7

C. 28

D. Cannot be determined

Answer: D

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24. If the trace of the matrix A is 5, and the trace of the matrix B is 7, then find the matrix (3A + 2B).

A. 12

B. 29

C. 19

D. None of these

Answer: B

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25. If $A = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$, then find A^n, (where $n \in N$)

A. $\begin{bmatrix} 3n & 0 \\ 0 & 3n \end{bmatrix}$

B. $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

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

D. $I_{2 \times 2}$

Answer: C

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26. If A is a `2 xx 2 scalar matrix and 7 is the one of the elements in its principal diagonal, then the inverse of A is____.

A. $\begin{bmatrix} \frac{-1}{7} & 0 \\ 0 & \frac{-1}{7} \end{bmatrix}$

B. $\begin{bmatrix} 0 & -7 \\ -7 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

D. $\begin{bmatrix} \frac{1}{7} & 0 \\ 0 & \frac{1}{7} \end{bmatrix}$

Answer: D

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27. $A_1, A_2, A_3, \ldots\ldots, A_n$ and $B_1, B_2, B_3, \ldots., B_n$ are non-singular square matrices of order n such that $A_1B_1 = I_n, A_2B_2 = I_n, A_3B_3 = I_n, \ldots\ldots A_nB_n = I_n$ then$(A_1A_2A_3\ldots\ldots$ = _____.

A. $B_1B_2B_3\ldots B_n$

B. $B_1^{-1}B_2^{-1}B_3^{-1}\ldots B_n^{-1}$

C. $B_nB_n -_1 B_n -_2 \ldots. B_1$

D. $B_{n-1}B_{n-1^{-1}}B_{n-2^{-1}}\ldots B_1^{-1}$

Answer: C

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28. If $A = \begin{bmatrix} 5 & 6 \\ 9 & 9 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ p & 3 \end{bmatrix}$ and AB = BA, then p=_____.

A. $\frac{9}{2}$

B. $\frac{-2}{9}$

C. $\frac{-9}{2}$

D. $\frac{2}{9}$

Answer: A

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29. The inverse of a scalar matrix A of order 2×2, where one of the principal diagoanl elements is 5, is _____.

A. 5I

B. I

C. $\frac{1}{5}I$

D. $\frac{1}{25}I$

Answer: C

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30. If $A = \begin{bmatrix} 3 & -2 \\ 6 & 4 \end{bmatrix}$, then AA^{-1} =_____.

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

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

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

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

Answer: C

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Exercise Concept Application Level 2

1. If $A = \begin{pmatrix} 4 & 22 \\ -1 & -6 \end{pmatrix}$, then find $A + A^{-1}$.

A. $\begin{bmatrix} 8 & -11 \\ -1 & -6 \end{bmatrix}$

B. $\begin{bmatrix} 7 & 33 \\ \frac{1}{2} & -4 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 33 \\ -\frac{3}{2} & -8 \end{bmatrix}$

D. $\begin{bmatrix} 7 & 33 \\ -\frac{3}{2} & -4 \end{bmatrix}$

Answer: C

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2. If $A = \begin{bmatrix} 4 & p \\ 3 & -4 \end{bmatrix}$ and $A - A^{-1} = 0$, then p = ____.

A. 4

B. 3

C. -5

D. 5

Answer: C

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3. If $\begin{pmatrix} 11 & -4 \\ 8 & -3 \end{pmatrix}\begin{pmatrix} -x & 4 \\ -8 & y \end{pmatrix} = -\begin{pmatrix} 2 & 3 \\ 6 & 9 \end{pmatrix}$, then find 2x - y.

A. -5

B. 5

C. 0

D. 14

Answer: A

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4. If $\begin{bmatrix} a^x \\ a^{-x} \end{bmatrix}[1 \quad 2] = \begin{bmatrix} p & a^{-2} \\ q & \log_2 2 \end{bmatrix}, (a > 0)$ then $a^{p-q} =$

A. $2^{\frac{3}{2}}$

B. $2^{\frac{-3}{2}}$

C. 1

D. $4^{\frac{3}{2}}$

Answer: D

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5. If the matrix $\begin{bmatrix} 2^a & 32 \\ 36 & 12^b \end{bmatrix}$ is singular and if $k = \frac{2a}{ca+1}$, then find c.

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

B. $\frac{3}{2}$

C. $\frac{4}{5}$

D. $\frac{3}{4}$

Answer: A

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6. If $A = \begin{bmatrix} 7 & 6 \\ -8 & -7 \end{bmatrix}$ then find $\left(A^{12345}\right)^{-1}$.

A. A^T

B. A

C. I

D. Cannot be determined

Answer: B

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7. The inverse of a diagonal matrix, whose principal diagonal elements are l, m is

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

B. $\begin{bmatrix} l & 0 \\ 0 & m \end{bmatrix}$

C. $\begin{bmatrix} l^2 & 0 \\ 0 & m^2 \end{bmatrix}$

D. $\begin{bmatrix} 2l & 0 \\ 0 & 2m \end{bmatrix}$

Answer: A

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8. If $\begin{bmatrix} 4^b & 288 \\ 72 & 18^a \end{bmatrix}$ is a singular matrix and $2b = a + \frac{1}{c}$ then c is

A. 4

B. $\frac{1}{4}$

C. $\frac{1}{6}$

D. 6

Answer: B

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9. If A is a non-singular square matrix such that $A^2 - 7A + 5I = 0$, then A^{-1}

A. $7A - I$

B. $\frac{7}{5}I - \frac{1}{5}A$

C. $\frac{7}{5}I + \frac{1}{5}A$

D. $\frac{A}{5} - \frac{7}{5}$

Answer: B

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10. If $A = a\begin{bmatrix} -1 & 0 \\ -1 & 2 \end{bmatrix}$ nd B $= \begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix}$, then find B^{-1}, A^{-1}.

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

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

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

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

Answer: C

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11. If $P = \begin{bmatrix} \sec\alpha & \tan\alpha \\ -\cot\alpha & \cos\alpha \end{bmatrix}$ and $Q = \begin{bmatrix} -\cos\alpha & \tan\alpha \\ -\cot\alpha & -\sec\alpha \end{bmatrix}$, than $2P^{-1} + Q =$

A. $\begin{bmatrix} \cos\alpha & -\tan\alpha \\ \cot\alpha & \sec\alpha \end{bmatrix}$

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

C. $\begin{bmatrix} -\cos\alpha & \tan\alpha \\ -\cot\alpha & -\sec\alpha \end{bmatrix}$

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

Answer: B

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12. If A is a skew-symmetric matrix such that $AB = aI$, then find $\left(A^{-1}\right)^T$

A. $-1B$

B. $\left(-aB^T\right)$

C. $\frac{B}{a}$

D. $-\frac{B}{a}$

Answer: D

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13. If $A = \begin{bmatrix} 8 & -7 \\ 9 & -8 \end{bmatrix}$, then $\left(A^{2007}\right)^{-1}$ =___.

A. I

B. 2A

C. A

D. 2007I

Answer: C

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14. If the matrix $\begin{pmatrix} 10 & -9 \\ 5x+7 & 5 \end{pmatrix}$ is non-singular, then the range of x.

A. $\frac{113}{45}$

B. $R - \left\{\frac{-113}{45}\right\}$

C. $R - \left\{\frac{113}{45}\right\}$

D. $\frac{-113}{45}$

Answer: B

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15. If AB = BA, then prove that ABAB = A^2B^2. The following are the steps involved in proving the above result. Arrange them in the sequential order.

(A) ABAB =A(BA)B

(B) (AA)(BB)

(C) A(AB)B

(D) A^2B^2

A. ABCD

B. ACBD

C. BCAD

D. ADBC

Answer: B

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16. The following are the steps in finding the matrix B, if $B+\begin{pmatrix}2&3\\4&5\end{pmatrix}=\begin{pmatrix}5&4\\3&2\end{pmatrix}$. Arrange them in sequential order.

(A) $\therefore \begin{pmatrix}p&q\\r&s\end{pmatrix}+\begin{pmatrix}2&3\\4&5\end{pmatrix}=\begin{pmatrix}5&4\\3&2\end{pmatrix}$

(B) Let $B=\begin{pmatrix}p&q\\r&s\end{pmatrix}$

(C) $\begin{pmatrix} p+2 & q+3 \\ r+4 & s+5 \end{pmatrix} = \begin{pmatrix} 5 & 4 \\ 3 & 2 \end{pmatrix}$

(D) $P+2=5, q+3=4, r+4=3, s+5=2$

$\Rightarrow p=3, q=1, r=-1, s=-3$

(E) $\therefore B = \begin{pmatrix} 3 & 1 \\ -1 & -3 \end{pmatrix}$

A. BACDE

B. BADCE

C. BDCAE

D. BADEC

Answer: A

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17. $(AB)^{-1}$ =____.

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

B. $B^{-1}A$

C. AB^{-1}

D. $B^{-1}A^{-1}$

Answer: D

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18. If $\begin{vmatrix} 2 & -4 \\ 9 & d-3 \end{vmatrix}$=4, then d = _____.

A. 13

B. 26

C. -13

D. -26

Answer: C

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19. If $A = \begin{pmatrix} 2 & 3 \\ 6 & 9 \end{pmatrix}$, then find |A|.

A. 0

B. 1

C. 2

D. 3

Answer: A

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Exercise Concept Application Level 3

1. The number of integral values of x for which the determinant of the matrix $\begin{bmatrix} 5x+14 & -2 \\ 7x+8 & x \end{bmatrix}$ is alwats less than 1 is

A. 3

B. 4

C. 5

D. 6

Answer: B

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2. If $A = \begin{bmatrix} x^2 & y^2 \\ \log_{1024} a & -9 \end{bmatrix}, a = 16^{25}$ and if $A = A^{-1}$, then $\begin{bmatrix} x^2 & y \\ 1 & x^2 + y \end{bmatrix}$ = _____.

A. $\frac{1}{65}\begin{bmatrix} 7 & 2 \\ -1 & 9 \end{bmatrix}$

B. $\frac{1}{65}\begin{bmatrix} 7 & -2 \\ 1 & 9 \end{bmatrix}$

C. $\frac{1}{65}\begin{bmatrix} 7 & 2 \\ 1 & 9 \end{bmatrix}$

D. $\frac{1}{65}\begin{bmatrix} 9 & 2 \\ -1 & 7 \end{bmatrix}$

Answer: A

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3. If $A = \begin{pmatrix} 5 & 5 \\ 0 & 0 \end{pmatrix}\begin{pmatrix} 0 & 0 \\ 5 & 5 \end{pmatrix}$ and $A^n = \begin{pmatrix} 5^{200} & 5^{200} \\ 0 & 0 \end{pmatrix}$, then find n.

A. 100

B. 50

C. 25

D. None of these

Answer: A

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4. If $\begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2008} = \begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2010}$ then $\begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2009}$ is

A. $\begin{pmatrix} 7 & -6 \\ 8 & -7 \end{pmatrix}^{2008} + \begin{pmatrix} 7 & -6 \\ 8 & -7 \end{pmatrix}^{2010}$

B. $\frac{1}{2}\left[\begin{pmatrix} 7 & -6 \\ 8 & -7 \end{pmatrix}^{2010} - \begin{pmatrix} 7 & -6 \\ 8 & -7 \end{pmatrix}^{2008}\right]$

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

D. $\begin{pmatrix} 7 & -6 \\ 8 & -7 \end{pmatrix}$

Answer: D

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5. If $A = \begin{bmatrix} \sin\theta & \tan\theta \\ \tan\theta & \sin\theta \end{bmatrix}$ has no multiplicative inverse, then____.

A. $q = 0^\circ$

B. $q = 45^\circ$

C. $q = 60^\circ$

D. q = 30

Answer: A

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6. A and B are two square matrices of same order. If $AB = B^{-1}$, then A^{-1} =____.

A. BA

B. A^2

C. B^2

D. B

Answer: C

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7. $A = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$ where p, q, r and s are positive integers. If A is symmetric matrix, $|A| = 20$ and p = q, then find how many values are possible for s.

A. 1

B. 2

C. 3

D. 4

Answer: C

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8. If $A = \begin{bmatrix} 2 & 0 \\ 5 & -3 \end{bmatrix}, B = \begin{bmatrix} -2 & 1 \\ 3 & -1 \end{bmatrix}$ then find the trace of $\left(AB^T\right)^T$

A. 10

B. 14

C. -4

D. -18

Answer: B

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9. If A is a 2 × 3 matrix and B is 3 × 2 matrix, then the order of $(AB)^T$ is equal to the order of

A. AB

B. $A^T B^T$

C. BA

D. All of these

Answer: A

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10. If $A_{2\times 3}, B_{4\times 3}$ and $C_{2\times 4}$ are three matrices, then which of the following is/are defined?

A. $AC^T B$

B. $B^T C^T A$

C. $AB^T C$

D. $A^T BC$

Answer: B

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11. If $A = \begin{bmatrix} 2 & 4 \\ k & -2 \end{bmatrix}$ and $A^2 = O$, find the value of k.

A. -4

B. -3

C. -2

D. -1

Answer: D

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12. If $A = \begin{bmatrix} a & b & c \\ x & y & z \\ l & m & n \end{bmatrix}$ is a skew-symmetric matrix, then which of the following is equal to $x + y + z$?

A. $a + b + c$

B. $l + m + n$

C. $a - b - m$

D. $c - l - m$

Answer: C

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13. If $A = \begin{bmatrix} 0 & 4 & -2 \\ x & 0 & -y \\ 2 & -8 & 0 \end{bmatrix}$ is a skew-symmetric matrix, then x-y =_____.

A. 8

B. 4

C. -12

D. -8

Answer: B

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14. In solving simultaneous linear equations Crammer's method, $B_1 = \begin{bmatrix} 3 & 3 \\ 4 & 1 \end{bmatrix}$ and $B_2 = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$, then det $A =$_ _ _ A is the coefficient matrix)

A. -1

B. -2

C. 3

D. 4

Answer: A

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15. $M = \begin{pmatrix} p & q \\ r & s \end{pmatrix}$ is a sin gular matrix. Its determinantis equal to its trace, then $p =$

A. $-q$

B. r

C. 0

D. $-s$

Answer: D

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