MATHS

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MATRICES

Questions

1. If a matrix has 24 elements, what are the possible orders it can have? What, if it has 13 elements?

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2. Construct a 3×2 matrix whose elements are given by $a_ij = \frac{1}{2}|i - 3j|$

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3. Construct a 3×4 matrix, whose elements are given by: $a_ij = \frac{1}{2}| - 3i + j|$

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4. Construct a 2×3 matrix, $A = |a_{ij}|$, where $a_{ij} = \frac{(1+j)^2}{2}$.

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5. Construct a 2×2 matrix whose elements are

$$a_{ij} = \frac{\left(i + 2\hat{j}\right)^2}{2}$$

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6. If a matrix has 5 elements, write all possible order it can have.

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7. Construct a 3×4 matrix, whose elements are given by:

$a_i j = 2i - j$

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8. Find the values of x, y and z from the following equation:

$$\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$$

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9. If $\begin{bmatrix} x+3y & y \\ 7-x & 4 \end{bmatrix} = \begin{bmatrix} 4 & -1 \\ 0 & 4 \end{bmatrix}$, find the values of x and y.

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10. Find the value of y, if

$$\begin{bmatrix} x-y & 2 \\ x & 5 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 5 \end{bmatrix}$$

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11. Find the values of x, y and 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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12. Find the values of x and y 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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13. Compute the following: :

$$\begin{bmatrix} -1 & 4 & -6 \\ 8 & 5 & 16 \\ 2 & 8 & 5 \end{bmatrix} + [[12, 7, 6], [8, 0, 5], [3, 2, 4]$$

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14. Compute the following :

$$\begin{bmatrix} \cos^2 x & \sin^2 x \\ \sin^2 x & \cos^2 x \end{bmatrix} + \begin{bmatrix} \sin^2 x & \cos^2 x \\ \cos^2 x & \sin^2 x \end{bmatrix}$$

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

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16. If $A = \begin{bmatrix} \frac{2}{3} & 1 & \frac{5}{3} \\ \frac{1}{3} & \frac{2}{3} & \frac{4}{3} \\ \frac{7}{3} & 2 & \frac{2}{3} \end{bmatrix}$ and $B = \begin{bmatrix} \frac{2}{5} & \frac{3}{5} & 1 \\ \frac{1}{5} & \frac{2}{5} & \frac{4}{5} \\ \frac{7}{5} & \frac{6}{5} & \frac{2}{5} \end{bmatrix}$, then compute $3A - 5B$

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17. Find X and Y, if $2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$ and $3X + 2Y = \begin{bmatrix} 2 & -2 \\ -1 & 5 \end{bmatrix}$

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18. Find x and y, if $(2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix})$

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19. Given $3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$, find the values of x, y, z and w.

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20. Find the values of x, y and z from the equations

$$\begin{bmatrix} x+y & 2 \\ -5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ -5 & 8 \end{bmatrix}$$

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21. Compute the indicated products: $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \begin{bmatrix} 2 & 3 & 4 \end{bmatrix}$

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22. Compute the indicated products: $\begin{bmatrix} 2 & 1 \\ 3 & 2 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 1 \end{bmatrix}$

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23. Compute the indicated products: $\begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & -3 & 5 \\ 0 & 2 & 4 \\ 3 & 0 & 5 \end{bmatrix}$

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24. If $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that $f(x).\, f(y) = f(x+y)$

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25. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$.

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26. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find k so that $A^2 = kA - 2I$

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27. If $A = \begin{bmatrix} 0 & -\frac{\tan\alpha}{2} \\ \frac{\tan\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

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28. A trust fund has Rs. 30,000 that must be invested in two different types of bonds. The first bond pays 5% interest per year and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs. 30,000 among the two types of bonds. If the trust fund must obtain an annual total interest of :

Rs. 1,800

29. A trust fund has Rs. 30,000 that must be invested in two different types of bonds. The first bond pays 5% interest per year and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs. 30,000 among the two types of bonds. If the trust fund must obtain an

annual total interest of :

Rs. 2,000

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30. The book shop of a particular school has 10 dozen Chemistry books, 8 dozen Physics books, 10 dozen Economics books. The selling prices are Rs 80, Rs 60 and Rs 40 each respectively. Find rhe total amount the book-shop will receive from selling all the books, using matrix algebra.

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31. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$,then find A' - B'

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32. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$,then find A' - B'

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33. For the matrices A and B, verify that $(AB)' = B'A'$, where

: $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}, B = \begin{bmatrix} -1 & 2 & 1 \end{bmatrix}$

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34. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$,then find A' - B'

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35. If A $= \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 & -6 \end{bmatrix}$, then verify that (AB)' = B'A'

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36. If $A = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}, B = [1, 5, 7],$ verify that (AB)' = B'A'.

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37. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then verify that $A'A = I$

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38. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A - A')$ is a skew symmetric matrix.

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39. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$, then verify that $(A + B)' = A' + B'$

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40. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$, then verify that $(A + B)' = A' + B'$

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

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42. For the matrix $A = \begin{pmatrix} 1 & 5 \\ 6 & 7 \end{pmatrix}$, verify that : A + A' is a Symmetric Matrix

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43. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A - A')$ is a skew symmetric matrix.

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44. Find $\frac{1}{2}(A + A')$ and $\frac{1}{2}(A - A')$, when $A = \begin{bmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{bmatrix}$.

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45. Show that the matrix $A = \begin{bmatrix} 1 & -1 & 5 \\ -1 & 2 & 1 \\ 5 & 1 & 3 \end{bmatrix}$ is a symmetric matrix.

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46. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A + A')$ is a symmetric matrix.

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47. Using elementary transformations, find the inverse of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$.

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48. Using elementary transformation, find the inverse of $\begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$.

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49. Using elementary operations, find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$ if exists.

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50. By using elementary operations, find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$

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

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52. Using elementary transformations find the inverse of the matrix $A = \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$

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53. Using elementary transformations find the inverse of matrix $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

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54. Using elementary transformations find the inverse of the matrix $A = \begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$

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55. Using elementary transformations, find the inverse of each of the matrix, if it exists: $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

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56. Using elementary transformations, find the inverse of the following matrix : $\begin{bmatrix} 2 & -1 & 4 \\ 4 & 0 & 2 \\ 3 & -2 & 7 \end{bmatrix}$

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57. Obtain the inverse of the following matrix using elementary operations :

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

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58. Find P^{-1}, if it exists, given $P = \begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$.

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59. If a matrix has 24 elements, what are the possible orders it can have? What, if it has 13 elements?

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64. If a matrix has 5 elements, write all possible order it can have.

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65. Construct a 3×4 matrix, whose elements are given by:

$a_ij = 2i - j$

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66. Find the values of x, y and z from the following equation:

$$\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$$

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67. If $\begin{bmatrix} x+3y & y \\ 7-x & 4 \end{bmatrix} = \begin{bmatrix} 4 & -1 \\ 0 & 4 \end{bmatrix}$, find the values of x and y.

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68. Find the value of y, if

$$\begin{bmatrix} x-y & 2 \\ x & 5 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 5 \end{bmatrix}$$

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69. Find the values of x, y and 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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70. Find the value of (y-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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71. Compute the following:

$$\begin{bmatrix} -1 & 4 & -6 \\ 8 & 5 & 16 \\ 2 & 8 & 5 \end{bmatrix} + \begin{bmatrix} 12 & 7 & 6 \\ 8 & 0 & 5 \\ 3 & 2 & 4 \end{bmatrix}$$

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72. Compute the following :

$$\begin{bmatrix} \cos^2 x & \sin^2 x \\ \sin^2 x & \cos^2 x \end{bmatrix} + \begin{bmatrix} \sin^2 x & \cos^2 x \\ \cos^2 x & \sin^2 x \end{bmatrix}$$

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

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74. If $A = \begin{bmatrix} \frac{2}{3} & 1 & \frac{5}{3} \\ \frac{1}{3} & \frac{2}{3} & \frac{4}{3} \\ \frac{7}{3} & 2 & \frac{2}{3} \end{bmatrix}$ and $B = \begin{bmatrix} \frac{2}{5} & \frac{3}{5} & 1 \\ \frac{1}{5} & \frac{2}{5} & \frac{4}{5} \\ \frac{7}{5} & \frac{6}{5} & \frac{2}{5} \end{bmatrix}$, then compute $3A - 5B$

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75. Find X and Y, if $2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$ and $3X + 2Y = \begin{bmatrix} 2 & -2 \\ -1 & 5 \end{bmatrix}$

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76. Find x and y if $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$

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77. Given $3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$, find the values of x, y, z and w.

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78. Find the values of x, y and z from the equations

$$\begin{bmatrix} x+y & 2 \\ -5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ -5 & 8 \end{bmatrix}$$

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79. Compute the indicated products: $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \begin{bmatrix} 2 & 3 & 4 \end{bmatrix}$

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80. Compute the indicated products: $\begin{bmatrix} 2 & 1 \\ 3 & 2 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 1 \end{bmatrix}$

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81. Compute the indicated products: $\begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & -3 & 5 \\ 0 & 2 & 4 \\ 3 & 0 & 5 \end{bmatrix}$

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82. If $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that $f(x).\, f(y) = f(x+y)$

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83. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$.

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84. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find k so that $A^2 = kA - 2I$

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85. If $A = \begin{bmatrix} 0 & -\frac{\tan\alpha}{2} \\ \frac{\tan\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

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86. A trust fund has Rs. 30,000 that must be invested in two different types of bonds. The first bond pays 5% interest per year and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs. 30,000 among the two types of bonds. If the trust fund must obtain an annual total interest of :

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87. A trust fund has Rs. 30,000 that must be invested in two different types of bonds. The first bond pays 5% interest per year and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs. 30,000 among the two types of bonds. If the trust fund must obtain an

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88. The bookshop of a particular school has 10 dozen chemistry books, 8 dozen physics books, 10 dozen economics books. Their selling prices are Rs. 80, Rs. 60 and Rs. 40 each respectively. Find the total amount the bookshop will receive from selling all the books using matrix algebra.

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89. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, then verify that : $(A + B)' = A' + B'$.

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90. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, then verify that (A-B)' = A' - B'

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91. For the matrices A and B, verify that $(AB)' = B'A'$, where : $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}, B = \begin{bmatrix} -1 & 2 & 1 \end{bmatrix}$

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92. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$,then find A' - B'

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93. If A $= \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$, $B = [1 \quad 3 \quad -6]$, then verify that (AB)' = B'A'

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94. If $A = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $B = [1, 5, 7]$, verify that (AB)' = B'A'.

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95. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, verify that $AA' = I_2 = A'A$

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96. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A - A')$ is a skew symmetric matrix.

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97. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$, then show that $(A + B) = A' + B'$

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98. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$, then verify that $(A + B)' = A' + B'$

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

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100. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A + A')$ is a symmetric matrix.

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101. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A - A')$ is a symmetric matrix.

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102. If $A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ find $(AB)^{-1}$ I

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103. Show that the matrix $A = \begin{bmatrix} 1 & -1 & 5 \\ -1 & 2 & 1 \\ 5 & 1 & 3 \end{bmatrix}$ is a symmetric matrix.

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104. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that $(A - A')$ is a skew symmetric matrix.

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105. Using elementary transformations, find the inverse of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$.

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106. Using elementary transformation, find the inverse of $\begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$.

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107. Using elementary operations, find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$ if exists.

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108. By using elementary operations, find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$

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

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110. Using elementary transformations find the inverse of the matrix $A = \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$

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111. Using elementary transformations find the inverse of matrix $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

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112. Using elementary transformations find the inverse of the matrix $A = \begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$

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113. Using elementary operations find the inverse of the matrix $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ if exits.

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114. Using elementary transformations, find the inverse of the following matrix : $\begin{bmatrix} 2 & -1 & 4 \\ 4 & 0 & 2 \\ 3 & -2 & 7 \end{bmatrix}$

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115. Obtain the inverse of the following matrix using elementary operations :

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

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116. Find P^{-1}, if it exists, given $P = \begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$.

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Important Questions From Miscellaneous Exercise

1. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, prove that $A^n = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}, n \in N$

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2. Find x, if $\begin{bmatrix} x & -5 & -1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = 0$

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3. For what values of x :

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

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4. A manufacturer produces three products x, y, z which he sells in two markets. Annual sales are indicated below :

Market Products

I	10,000	2,000	18,000
II	6,000	20,000	8,000

If unit sale prices of x, y and z are Rs. 2.50, Rs. 1.50 and Rs. 1.00, respectively, find the total revenue in each market with the help of matrix algebra.

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5. A manufacturer produces three products x, y, z which he sells in two markets. Annual sales are indicated below :

Market Products

I	10,000	2,000	18,000
II	6,000	20,000	8,000

If the unit costs of the above three commodities are Rs. 2.00, Rs. 1.00 and 50 paise respectively. Find the gross profit.

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6. Find the matrix X so that $X\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix}=\begin{bmatrix}-7 & -8 & -9\\ 2 & 4 & 6\end{bmatrix}$.

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7. f A and B are square matrices of the same order such that AB = BA, then prove by induction that $AB^n = B^nA$ Further, prove that $(AB)^n = A^nB^n$ for all $n \in N$

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8. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, prove that $A^n = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}, n \in N$

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9. Solve the matrix equation $\begin{bmatrix} x & -5 & -1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = 0$

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10. For what values of x :

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

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11. A manufacturer produces three products x, y, z which he sells in two markets. Annual sales are indicated below :

Market	Products		
I	10,000	2,000	18,000
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If unit sale prices of x, y and z are Rs. 2.50, Rs. 1.50 and Rs. 1.00, respectively, find the total revenue in each market with the help of matrix algebra.

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12. A manufacturer produces three products x, y, z which he sells in two markets. Annual sales are indicated below :

Market	Products		
I	10,000	2,000	18,000
II	6,000	20,000	8,000

If the unit costs of the above three commodities are Rs. 2.00, Rs. 1.00 and 50 paise respectively. Find the gross profit.

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13. Find the matrix X so that $X\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix} = \begin{bmatrix}-7 & -8 & -9\\ 2 & 4 & 6\end{bmatrix}$.

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14. f A and B are square matrices of the same order such that AB = BA, then prove by induction that $AB^n = B^nA$ Further, prove that $(AB)^n = A^nB^n$ for all $n \in N$

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Multiple Choice Questions

1. Assume X, Y, Z, W and P are matrices of order $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$ respectively. The restriction on n, k and p so that PY + WY will be defined are:

A. $k = 3, p = n$

B. k is arbitrary, $p = 2$

C. p is arbitrary, $k = 3$

D. $k = 2, p = 3$

Answer: A

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2. Assume X, Y, Z, W and P are matrices of order $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$ respectively.If n = p, then the order of the matrix $7X - 5Z$is:

A. $p \times 2$

B. $2 \times n$

C. $n \times 3$

D. $p \times n$

Answer: B

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3. $A = [a_{ij}]_{m \times n}$ is a square matrix, if

a. m < n

b. m > n

c. m = n

d. none of these

A. $m < n$

B. $m > n$

C. $m = n$

D. none of these

Answer: C

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4. Which of the given values of x and y make the following pair of matrices equal $\begin{bmatrix} 3x+2 & 5 \\ y+1 & 2-3x \end{bmatrix}, \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$

A. $x = -\frac{1}{3}, y = 7$

B. not possible to find

C. $x = -\frac{2}{3}, y = 7$

D. $x = -\frac{1}{3}, y = -\frac{2}{3}$

Answer: B

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5. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, then $A + A' = 1$, if the value of α is

a. π/ 6

b. π/ 3

c. π

d. 3 π/ 2

A. $\frac{\pi}{6}$

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

C. π

D. $\frac{3\pi}{2}$

Answer: B

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6. Matrices A and B will be inverse of each other only if

a. AB = BA

b. AB = BA = 0

c. AB = 0, BA = I

d. AB = BA = I

A. AB = BA

B. AB = BA = 0

C. AB = 0, BA = I

D. AB = BA = I

Answer: D

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7. If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then

a. $1 + \alpha^2 + \beta\gamma = 0$

b. $1 - \alpha^2 + \beta\gamma = 0$

c. $1 - \alpha^2 - \beta\gamma = 0$

d. $1 + \alpha^2 - \beta\gamma = 0$

A. $1 + \alpha^2 + \beta\gamma = 0$

B. $1 - \alpha^2 + \beta\gamma = 0$

C. $1 - \alpha^2 - \beta\gamma = 0$

D. $1 + \alpha^2 - \beta\gamma = 0$

Answer: C

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8. If the matrix A is both symmetric and skew symmetric, then :

A. A is diagonal matrix

B. A is a zero matrix

C. A is a square matrix

D. none of these

Answer: A::B

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9. If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to

a. A

b. I - A

c. I

d. 3A

A. A

B. $I - A$

C. I

D. 3A

Answer: C

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10. If $A = [a_{ij}]_{\text{mxn}}$ is a rectangular matrix, then

A. $m < n$

B. $m > n$

C. $m = n$

D. none of these

Answer: C

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11. If A, B symmetric matrices of the same order. Then $AB - BA$ is a

a. Skew symmetric matrix

b. Symmetric matrix

c. Zero matrix

d. Identify matrix

A. Skew symmetric matrix

B. Symmetric matrix

C. Zero matrix

D. Identify matrix

Answer: A

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12. The number of all possible matrices of order 3×3 with each entry 0 or 1 is:

A. 27

B. 18

C. 81

D. 512

Answer: D

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13. If A matrix is symmetric as well as skew symmetric, then

a. A is diagonal matrix

b. A null matrix

c. A unit matrix

d. none of these

A. A is diagonal matrix

B. A null matrix

C. A unit matrix

D. none of these

Answer: B

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14. Matrices A and B will be inverse of each other only if

a. AB = BA

b. AB = BA = 0

c. AB = 0, BA = I

d. AB = BA = I

A. AB = BA

B. AB = BA = 0

C. AB = 0, BA = I

D. AB = BA = I

Answer: D

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15. Assume X, Y, Z, W and P are matrices of order $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$ respectively. The restriction on n, k and p so that PY + WY will be defined are:

A. $k = 3, p = n$

B. k is arbitrary, $p = 2$

C. p is arbitrary, $k = 3$

D. $k = 2, p = 3$

Answer: A

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16. Assume X, Y, Z, W and P are matrices of order $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$ respectively.If n = p, then the order of the matrix $7X - 5Z$is:

A. $p \times 2$

B. $2 \times n$

C. $n \times 3$

D. $p \times n$

Answer: B

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17. $A = [a_{ij}]_{m \times n}$ is a square matrix, if

a. m < n

b. m > n

c. m = n

d. none of these

A. $m < n$

B. $m > n$

C. $m = n$

D. none of these

Answer: C

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18. Which of the given values of x and y make the following pair of matrices equal

$$\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix}, \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$$

A. $x = -\frac{1}{3}, y = 7$

B. not possible to find

C. $x = -\frac{2}{3}, y = 7$

D. $x = -\frac{1}{3}, y = -\frac{2}{3}$

Answer: B

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19. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, then $A + A' = 1$, if the value of α is

a. π/ 6

b. π/ 3

c. π

d. 3 π/ 2

A. $\frac{\pi}{6}$

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

C. π

D. $\frac{3\pi}{2}$

Answer: B

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20. Matrices A and B will be inverse of each other only if

A. AB = BA

B. AB = BA = 0

C. AB = 0, BA = I

D. AB = BA = I

Answer: D

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21. If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then

a. $1 + \alpha^2 + \beta\gamma = 0$

b. $1 - \alpha^2 + \beta\gamma = 0$

c. $1 - \alpha^2 - \beta\gamma = 0$

d. $1 + \alpha^2 - \beta\gamma = 0$

A. $1 + \alpha^2 + \beta\gamma = 0$

B. $1 - \alpha^2 + \beta\gamma = 0$

C. $1 - \alpha^2 - \beta\gamma = 0$

D. $1 + \alpha^2 - \beta\gamma = 0$

Answer: C

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22. If the matrix A is both symmetric and skew symmetric, then :

A. A is diagonal matrix

B. A is a zero matrix

C. A is a square matrix

D. none of these

Answer: A::B

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23. If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to

a. A

b. I – A

c. I

d. 3A

A. A

B. $I - A$

C. I

D. 3A

Answer: C

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24. $A = \left[a_{ij}\right]_{m \times n}$ is a square matrix, if

a. m < n

b. m > n

c. m = n

d. none of these

A. $m < n$

B. $m > n$

C. $m = n$

D. none of these

Answer: C

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25. If A, B symmetric matrices of the same order. Then $AB - BA$ is a

a. Skew symmetric matrix

b. Symmetric matrix

c. Zero matrix

d. Identify matrix

A. Skew symmetric matrix

B. Symmetric matrix

C. Zero matrix

D. Identify matrix

Answer: A

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26. The number of all possible matrices of order 3×3 with each entry 0 or 1 is:

A. 27

B. 18

C. 81

D. 512

Answer: D

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27. If A matrix is symmetric as well as skew symmetric, then

a. A is diagonal matrix

b. A null matrix

c. A unit matrix

d. none of these

A. A is diagonal matrix

B. A null matrix

C. A unit matrix

D. none of these

Answer: B

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28. Matrices A and B will be inverse of each other only if

A. AB = BA

B. AB = BA = 0

C. $AB = 0, BA = I$

D. $AB = BA = I$

Answer: D

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