



MATHS

BOOKS - RD SHARMA MATHS

(HINGLISH)

ADJOINTS AND INVERSE OF MATRIX

Solved Examples And Exercises

1. Find the non-singular matrices A , if its is

given that $adj(A) = \begin{bmatrix} -1 & -2 & 1 \\ 3 & 0 & -3 \\ 1 & -4 & 1 \end{bmatrix}$



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2. If A is a non-singular matrix, prove that:

$adjA$ is also non-singular $(adjA)^{-1} = \frac{1}{|A|}A$

.



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3. If A is a non-singular matrix, prove that

$$(\text{adj}A)^{-1} = (\text{adj}A^{-1})$$



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4. Find the matrix A such that $|A| = 2$ and

$$\text{adj}(A) = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 5 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$



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5. If A is a square matrix of order 3 such that

$|A| = 2$, then write the value of $\text{adj}(\text{adj}A)$



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6. If A is a square matrix of order 3 such that

$|A| = 3$, then find the value of $|\text{adj}(\text{adj}A)|$



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7. Compute the adjoint of the matrix A given

by $A = \begin{bmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & 0 \end{bmatrix}$ and verify that

$$A(\text{adj}A) = |A|I = (\text{adj}A)A$$



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8. Find the inverse of the matrix

$$A = \begin{bmatrix} 8 & 4 & 2 \\ 4 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}$$



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9. If A is a square matrix of order n , prove that $|A \text{adj} A| = |A|^n$

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10. Find the adjoint of matrix

$$A = [a_{ij}] = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & -3 \\ -1 & 2 & 3 \end{bmatrix}$$

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11. For the matrix $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y

so that $A^2 + xI + yA = 0$ Hence, Find A^{-1}



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12. Show that the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$

satisfies the equation $A^2 - 4A - 5I_3 = 0$ and

hence find A^{-1}



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13. If $A = \begin{bmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ find adj and

verify that $A(adjA) = (adjA)A = |A|I_3$



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14. If $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, show that

$$A^T A^{-1} = \begin{bmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{bmatrix}$$



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15. If matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfies

$A' A = I$. Find the values of x , y and z



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16. Find a 2×2 matrix B such that

$$B \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$$



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17. Find the matrix A satisfying the matrix

equation
$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$



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18. If A is a symmetric matrix, write whether

A^T is symmetric or skew-symmetric.



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19. Using elementary row transformation find

the inverse of the matrix $A = \begin{bmatrix} 3 & -1 & -2 \\ 2 & 0 & -1 \\ 3 & -5 & 0 \end{bmatrix}$



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20. Let A be a non-singular matrix. Show that

$A^T A^{-1}$ is symmetric if $A^2 = (A^T)^2$



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21. If $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$ is such that

$$A^T = A^{-1}, \text{ find } \alpha$$



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22. Find the adjoint of matrix

$$A = [a_{ij}] = \begin{bmatrix} p & q \\ r & s \end{bmatrix}.$$



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23. Find the adjoint of matrix

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



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24. Compute the adjoint of the matrix A given

by $A = \begin{bmatrix} 1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and verify that

$$A(\text{adj}A) = |A|I = (\text{adj}A)A.$$



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25. Find the inverse of the matrix $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$.



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26. Find the inverse of the matrix

$$A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}.$$



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27. If A is an invertible matrix of order 3 and $|A| = 5$, then find $|adj A|$.



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28. If A is an invertible matrix of order 3×3 such that $|A| = 2$. Then, find $adj(adj A)$.



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29. If A is a square matrix of order 3 such that $|A| = 2$, then write the value of $|adj(adjA)|$.



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30. If $A = \begin{bmatrix} 3 & 0 & -1 \\ 2 & 3 & 0 \\ 0 & 4 & 1 \end{bmatrix}$, then find $|adj(adjA)|$.



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31. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, find $\text{adj } A$.



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32. If $A = \begin{bmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$,

find $\text{adj } A$ and verify that

$$A(\text{adj } A) = (\text{adj } A)A = |A|I_3.$$



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33. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, show that

$$A^{-1} = \frac{1}{19}A.$$



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34. Find the inverse of $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ and

verify that $A^{-1}A = I_3$.



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35. If $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, show that

$$A^T A^{-1} = \begin{bmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{bmatrix}.$$


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36. If $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.



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37. Show that $A = [2 - 334]$ satisfies the equation $x^2 - 6x + 17 = 0$. Hence, find A^{-1} .



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38. For the matrix $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y so that $A^2 + xI = yA$.



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39. For the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the numbers a and b such that $A^2 + aA + bI = O$. Hence, find A^{-1} .



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40. Show that the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $A^2 - 4A - 5I_3 = O$ and hence find A^{-1} .



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41. If $A = \begin{bmatrix} -1 & 2 & 0 \\ -1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, show that $A^{-1} = A^2$.



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42. Find a 2×2 matrix B such that

$$B \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}.$$



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43. Find the matrix A satisfying the matrix

equation $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}.$



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44. Find the matrix X for which

$$[1 \ -43 \ -2]X = [-16 \ -672].$$



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45. If $A = [01312x231]$ and

$$A^{-1} = [1/2 \ -45/2 \ -1/23 \ -3/21/2y1/2]$$

,find x, y .



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46. If $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$ is such that $A^T = A^{-1}$, find α .



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47. If matrix $A = \begin{bmatrix} 0 & 2 & y \\ z & x & y \\ -z & x - y & z \end{bmatrix}$ satisfies $A^T = A^{-1}$, find x, y, z .



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48. Find the matrix A such that $|A| = 2$ and

$$\text{adj}A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 5 & 1 \\ 0 & 1 & 1 \end{bmatrix}.$$



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49. If A is a non-singular matrix, prove that:

$\text{adj}(A)$ is also non-singular (ii)

$$(\text{adj} A)^{-1} = \frac{1}{|A|} A.$$



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50. If A is a non-singular matrix, prove that

$$(\text{adj } A)^{-1} = (\text{adj } A^{-1}).$$



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51. Find the non-singular matrices A , if it is

given

that

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



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52. If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$, find $(\text{adj } A)^{-1}$ and $(\text{adj } A^{-1})$.

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53. Let A be a non-singular matrix. Show that $A^T A^{-1}$ is symmetric if $A^2 = (A^T)^2$.

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54. Find the adjoint of the following matrices:

$$\begin{bmatrix} -3 & 5 \\ 2 & 4 \end{bmatrix} \quad (\text{ii}) \quad \begin{bmatrix} a & b \\ c & d \end{bmatrix} \quad \text{Verify that}$$

$(adj A)A = |A|I = A(adj A)$ for the above matrices.



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55. Find the adjoint of the following matrices:

$$[\cos \alpha \sin \alpha \sin \alpha \cos \alpha] \quad (\text{ii})$$

$$[1 \tan \alpha / 2 - \tan \alpha / 2] \quad \text{Verify that}$$

$(adj A)A = |A|I = A(adj A)$ for the above matrices.



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56. Compute the adjoint of each of the

following matrices: $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ (ii)

$\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$ (iii) $\begin{bmatrix} 2 & -1 & 3 \\ 4 & 2 & 5 \\ 0 & 4 & -1 \end{bmatrix}$ (iv)

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

Verify that

$(adj A)A = |A|I = A(adj A)$ for the above matrices.



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57. For the matrix $A = \begin{bmatrix} 1 & -1 & 1 & 2 & 3 & 0 & 1 & 8 & 2 & 1 & 0 \end{bmatrix}$, show that $A(adj A) = O$.



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58. If $A = \begin{bmatrix} -4 & -3 & -3 & 1 & 0 & 1 & 4 & 4 & 3 \end{bmatrix}$, show that $adj A = A$.



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59. If $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$, show that $\text{adj } A = 3A^T$.



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60. Find $A(\text{adj } A)$ for the matrix $A = \begin{bmatrix} 1 & -2 & 3 & 0 & 2 \\ -1 & -4 & 5 & 2 \\ 1 & -4 & 5 & 2 \end{bmatrix}$.



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61. Find the inverse of each of the following

matrices: $[\cos \theta \sin \theta \quad -\sin \theta \cos \theta]$ (ii) $[0110]$

(iii) $\left[ab \ c \frac{1+bc}{a} \right]$ (iv) $[25 \ - \ 31]$



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62. Find the inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$



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63. Find the inverse of $A = \begin{bmatrix} 1 & 2 & 5 \\ 1 & -1 & -1 \\ 2 & 3 & -1 \end{bmatrix}$



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64. Find the inverse of
 $[2 \ -11 \ -12 \ -11 \ -12]$



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65. Find the inverse of $[20 \ -1510013]$





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66. Find the inverse of $\begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$



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67. Find the inverse of $\begin{bmatrix} 0 & 0 & -1 \\ 3 & 4 & 5 \\ -2 & -4 & -7 \end{bmatrix}$



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68. Find the inverse of

$$\begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$$



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69. Find the inverse following matrix and verify

that $A^{-1}A = I_3$. $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$



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70. Find the inverse following matrix and verify that $A^{-1}A = I_3$. [231341372]



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71. For the following pair of matrix verify that

$$(AB)^{-1} = B^{-1}A^{-1} \quad . \quad A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} \quad \text{and}$$

$$B = \begin{bmatrix} 4 & 6 \\ 3 & 2 \end{bmatrix}$$



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72. For the following pair of matrix verify that

$$(AB)^{-1} = B^{-1}A^{-1} \quad . \quad A = [2153] \quad \text{and}$$

$$B = [4534]$$



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73. Let $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$. Find

$$(AB)^{-1}$$



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74. Given $A = \begin{bmatrix} 2 & -2 \\ -4 & 7 \end{bmatrix}$, compute A^{-1}

and show that $2A^{-1} = 9I - A$.



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75. If $A = \begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$, then show that

$$A - 3I = 2(I + 3A^{-1})$$



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76. Find the inverse of the matrix

$$A = \begin{bmatrix} a & b \\ c & \frac{1+bc}{a} \end{bmatrix} \quad \text{and show that}$$

$$aA^{-1} = (a^2 + bc + 1)I - aA.$$



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77. Given $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ and

$$B^{-1} = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}. \text{ Compute } (AB)^{-1}.$$



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78.

Let

$$F(\alpha) = \begin{bmatrix} \cos \alpha & -\sin \alpha & 0 & 0 \\ \sin \alpha & \cos \alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad \text{and}$$

$$G(\beta) = \begin{bmatrix} \cos \beta & 0 & \sin \beta & 0 \\ \sin \beta & 0 & \cos \beta & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} .$$

Show that $[F(\alpha)]^{-1} = F(-\alpha)$ (ii)

$$[G(\beta)]^{-1} = G(-\beta) \quad \text{(iii)}$$

$$[F(\alpha)G(\beta)]^{-1} = G(-\beta)F(-\alpha) .$$



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79. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, verify that

$$A^2 - 4A + I = O, \quad \text{where } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \text{and}$$

$O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. Hence, find A^{-1} .



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80. Show that $A = \begin{bmatrix} -8 & 5 \\ 2 & 4 \end{bmatrix}$ satisfies the equation $A^2 + 4A - 42I = O$. Hence, find A^{-1} .



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81. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = O$. Hence, find A^{-1} .



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82. If $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, find x and y such that $A^2 - xA + yI = O$. Hence, evaluate A^{-1} .



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83. If $A = \begin{bmatrix} 3 & -24 & -2 \end{bmatrix}$, find the value of λ so that $A^2 = \lambda A - 2I$. Hence, find A^{-1} .



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84. Show that $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies the equation $x^2 - 3x - 7 = 0$. Thus, find A^{-1}



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85. Show that $A = \begin{bmatrix} 6 & 5 \\ 7 & 6 \end{bmatrix}$ satisfies the equation $x^2 - 12x + 1 = 0$. Thus, find A^{-1}



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86. For the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$. Show

that $A^3 - 6A^2 + 5A + 11I_3 = O$. Hence,

find A^{-1} .



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87. Show that the matrix,

$A = \begin{bmatrix} 1 & 0 & -2 \\ -2 & -1 & 2 \\ 3 & 4 & 1 \end{bmatrix}$ satisfies the equation,

$A^3 - A^2 - 3A - I_3 = O$. Hence, find A^{-1} .



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88. If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. Verify that $A^3 - 6A^2 + 9A - 4I = O$ and hence find A^{-1} .



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89. If $A = \frac{1}{9} \begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$, prove that $A^{-1} = A^T$.



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90. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, show that

$$A^{-1} = A^3.$$



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91. If $A^2 = \begin{bmatrix} -1 & 0 & 2 \\ 0 & 0 & 1 \\ -1 & 1 & 1 \end{bmatrix}$, show that

$$A^2 = A^{-1}.$$



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92. Solve the matrix equation

$$\begin{bmatrix} 5 & 4 \\ 1 & 1 \end{bmatrix} X = \begin{bmatrix} 1 & -2 \\ 1 & 3 \end{bmatrix}, \text{ where } X \text{ is a } 2 \times 2 \text{ matrix.}$$



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93. Find the matrix X satisfying the matrix

$$\text{equation: } X \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 14 & 7 \\ 7 & 7 \end{bmatrix}.$$



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94. Find the matrix X for which:

$$\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} X \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}.$$



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95. Find the matrix X satisfying the equation:

$$\begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix} X \begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}.$$



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96. If $A = [122212221]$, find A^{-1} and prove that $A^2 - 4A - 5I = O$.



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97. If A is a square matrix of order n , prove that $|A \text{ adj } A| = |A|^n$.



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98. 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 $(AB)^{-1}$.



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99. If $A = \begin{bmatrix} 1 & -230 \\ -14 & -221 \end{bmatrix}$, find $(A^T)^{-1}$.



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100. Find the adjoint of the matrix

$$A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix} \text{ and hence show that}$$

$$A(\text{adj } A) = |A| I_3.$$



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101. Find A^{-1} if $A = \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}$ and show that

$$A^{-1} = \frac{A^2 - 3I}{2}$$



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102. Use elementary column operation

$C_2 \rightarrow C_2 - 2C_1$ in the matrix equation

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



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103. Apply elementary transformation

$R_2 \rightarrow R_2 - 3R_1$ in the matrix equation

$$\begin{bmatrix} 11 & -6 \\ 6 & -4 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix}$$



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104. Using elementary transformations, find

the inverse of the matrix $\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$



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105. Using elementary transformations, find

the inverse of the matrix $\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$



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106. Using elementary row transformation find the inverse of the matrix

$$A = [3 \quad -1 \quad -2 \quad 20 \quad -13 \quad -50]$$



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107. Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix} \text{ by using elementary}$$

row transformations.



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108. Find the inverse using elementary row transformations: $[714 - 3]$



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109. Find the inverse using elementary row transformations: $[16 - 35]$ (ii) $[2513]$



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110. Find the inverse using elementary row transformations: $[31027]$



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111. Find the inverse using elementary row transformations: $[012123311]$



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112. Find the inverse using elementary row transformations: $[20 \ - \ 1510013]$



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113. Find the inverse using elementary row transformations: $[231241372]$



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114. Find the inverse using elementary row transformations: $[3 \quad -342 \quad -340 \quad -11]$



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115. Find the inverse using elementary row transformations: $[12023 \quad -11 \quad -13]$



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116. Find the inverse using elementary row transformations: $[2 \ - \ 13124311]$



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117. Find the inverse using elementary row transformations: $[112311231]$



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118. Find the inverse using elementary row transformations: $[2 \ -1 \ 4 \ 0 \ 2 \ 3 \ -2 \ 7]$



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119. Find the inverse using elementary row

transformations:
$$\begin{bmatrix} 3 & 0 & -1 \\ 2 & 3 & 0 \\ 0 & 4 & 1 \end{bmatrix}$$



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120. Find the inverse using elementary row

transformations: $A = \begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$



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121. Find the inverse using elementary row

transformations: $A = \begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$



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122. Write the adjoint of the matrix

$$A = \begin{bmatrix} -3 & 4 \\ 7 & -2 \end{bmatrix}.$$



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123. If A is a square matrix such that $A(\text{adj } A) = 5I$, where I denotes the identity matrix of the same order. Then, find the value of $|A|$.



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124. If A is a square matrix of order 3 such that $|A| = 5$, write the value of $|\text{adj } A|$.



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125. If A is square matrix of order 3 such that $|\text{adj } A| = 64$, find $|A|$.



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126. If A is a non-singular square matrix such that $|A| = 10$, find $|A^{-1}|$



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127. If A, B, C are three non-null square matrices of the same order, write the condition on A such that $AB = AC \Rightarrow B = C$.



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128. If A is a non-singular square matrix such that $A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$, then find $(A^T)^{-1}$.



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129. If $\text{adj } A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ and $\text{adj } B = \begin{bmatrix} 1 & -2 \\ -3 & 1 \end{bmatrix}$, find $\text{adj } AB$.



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130. If A is a symmetric matrix, write whether A^T is symmetric or skew-symmetric.



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131. If A is a square matrix of order 3 such that $|A| = 2$, then write the value of $adj(adjA)$.



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132. If A is a square matrix of order 3 such that

$|A| = 3$, then find the value of $|adj(adjA)|$.



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133. If A is a square matrix of order 3 such that

$|A| = 2$, then write the value of $adj(adjA)$.



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134. If A is a square matrix, then write the matrix $\text{adj}(A^T) - (\text{adj } A)^T$.



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135. Let A be a 3×3 square matrix such that $A(\text{adj } A) = 2I$, where I is the identity matrix. Write the value of $|\text{adj } A|$.



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136. If A is a non-singular symmetric matrix, write whether A^{-1} is symmetric or skew-symmetric.



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137. If $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ and $A(\text{adj } A) = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then find the value of k .



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138. If A is an invertible matrix such that $|A^{-1}| = 2$, find the value of $|A|$.



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139. If A is a square matrix such that

$$A(\text{adj } A) = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}, \text{ then write the}$$

value of $|\text{adj } A|$.



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140. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that

$A^{-1} = k A$, then find the value of k .



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141. Let A be a square matrix such that

$A^2 - A + I = O$, then write A^{-1} in terms of

A .



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142. If A_{ij} is the cofactor of the element a_{ij} of

the determinant $\begin{bmatrix} 2 & -3 & -7 \\ 6 & 0 & 4 \\ 1 & 5 & 7 \end{bmatrix}$ then write

the value of $a_{32} \cdot A_{32}$.



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

.



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144. Find the inverse of the matrix

$$\begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$$



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

, write $\text{adj } A$.



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146. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find $\text{adj}(AB)$.



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147. If $A = \begin{bmatrix} 3 & 1 \\ 2 & -3 \end{bmatrix}$, then find $|\text{adj } A|$.



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148. If $|A| = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$

write A^{-1} in terms of A .



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149. Write A^{-1} for $A = [2513]$



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150. Use elementary column operation on applying $C_2 \rightarrow C_2 + 2C_1$

in the following matrix equation :

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



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151. If A is an invertible matrix, then which of the following is not true $(A^2)^{-1} = (A^{-1})^2$

(b) $|A^{-1}| = |A|^{-1}$ (c) $(A^T)^{-1} = (A^{-1})^T$ (d)

$$|A| \neq 0$$



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152. If A is an invertible matrix of order 3, then which of the following is not true (a)

$|adj A| = |A|^2$ (b) $(A^{-1})^{-1} = A$ (c) If

$BA = CA$, then $B \neq C$, where B and C are

square matrices of order 3 (d)

$$(AB)^{-1} = B^{-1}A^{-1}, \text{ where } B = ([b_{ij}])_{3 \times 3}$$

and $|B| \neq 0$



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

$(A + B)^{-1}$ (a) is a skew-symmetric matrix (b)

$A^{-1} + B^{-1}$ (c) does not exist (d) none of

these



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154. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $\text{adj } A$ is

$\begin{bmatrix} -d & -b \\ -c & a \end{bmatrix}$ (b) $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ (c) $\begin{bmatrix} d & b \\ c & a \end{bmatrix}$ (d)

$\begin{bmatrix} d & c \\ b & a \end{bmatrix}$



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155. If A is a singular matrix, then $\text{adj } A$ is a.

singular b. non singular c. symmetric d. not defined



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156. If A, B are two $n \times n$ non-singular matrices, then (1) AB is non-singular (2) AB is singular (3) $(AB)^{-1} = A^{-1}B^{-1}$ (4) $(AB)^{-1}$ does not exist



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157. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$

, then the value of $|adj A|$ is a^{27} (b) a^9 (c) a^6
(d) a^2



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158. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then

$\det(\text{adj}(\text{adj} A))$ is 14^4 (b) 14^3 (c) 14^2 (d) 14



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159. If B is a non-singular matrix and A is a square matrix, then $\det(B^{-1}AB)$ is equal to

(A) $\det(A^{-1})$ (B) $\det(B^{-1})$ (C) $\det(A)$ (D)

$\det(B)$



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160. For any 2×2 matrix, if $A (\text{adj } A) = [100010]$, then $|A|$ is equal to
(a) 20 (b) 100 (c) 10 (d) 0

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161. If $A^5 = O$ such that $A^n \neq I$ for $1 \leq n \leq 4$, then $(I - A)^{-1}$ is equal to

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162. If A satisfies the equation $x^3 - 5x^2 + 4x + \lambda = 0$, then A^{-1} exists if $\lambda \neq 1$ (b) $\lambda \neq 2$ (c) $\lambda \neq -1$ (d) $\lambda \neq 0$



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163. If for the matrix A , $A^3 = I$, then $A^{-1} = A^2$ (b) A^3 (c) A (d) none of these



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164. If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A + B)^2$ is equal to $A^2 + B^2$ b. O c. $A^2 + 2AB + B^2$ d. $A + B$



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165. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then $A^5 =$

(a) $5A$ (b) $10A$ (c) $16A$ (d) $32A$



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166. For non-singular square matrix A , B and C of the same order

$$(AB^{-1}C)^{-1} = A^{-1}BC^{-1} \quad (\text{b})$$

$C^{-1}B^{-1}A^{-1}$ (c) CBA^{-1} (d) $C^{-1}BA^{-1}$



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167. The matrix $\begin{bmatrix} 5 & 10 & 3 \\ -2 & -4 & 6 \\ -1 & -2 & b \end{bmatrix}$ is a singular

matrix, if the value of b is (a) -3 (b) 3 (c) 0 (d)

non-existent



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168. If A is a matrix of order 3 and $|A| = 8$, then $|\text{adj } A| =$ (a) 1 (b) 2 (c) 2^3 (d) 2^6



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169. If $A^2 - A + I = 0$, then the inverse of A is: (A) $A + I$ (B) A (C) $A - I$ (D) $I - A$



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170. If A and B are invertible matrices, which of the following statement is not correct.

$adj A = |A|A^{-1}$ (b) $\det(A^{-1}) = (\det A)^{-1}$

(c) $(A + B)^{-1} = A^{-1} + B^{-1}$ (d)

$(AB)^{-1} = B^{-1}A^{-1}$



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171. If A is a square matrix such that $A^2 = I$, then A^{-1} is equal to (i) I (ii) 0 (iii) A (iv) $I+A$



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172. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and

X be a matrix such that $A = BX$, then X is

equal to $\frac{1}{2} \begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ (b) $\frac{1}{2} \begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}$ (c)

$\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ (d) none of these



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173. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, show that

$$A^{-1} = \frac{1}{19}A.$$



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174. If $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ satisfies

$A^T A = I$, then $x + y =$ (a) 3 (b) 0 (c) -3 (d) 1



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175. If a matrix A is such that $3A^3 + 2A^2 + 5A + I = 0$, then A^{-1} is equal to



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176. If A is an invertible matrix of order 2, then $\det(A^{-1})$ is equal to (a) $\det(A)$ (B) $\frac{1}{\det(A)}$ (C) 1 (D) 0



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177. If $A = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}$, then $A^n = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, if n is an even natural number (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, if n is an odd natural number (c) $[-1, 0), (0, 1]$, if $n \in N$ (d) none of these



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178. If x, y, z are non-zero real numbers, then

the inverse of the matrix $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$, is

$[x^{-1}000y^{-1}000z^{-1}]$ (b)

$xyz[x^{-1}000y^{-1}000z^{-1}]$ (c) $\frac{1}{xyz}[x000y000z]$

(d) $\frac{1}{xyz}[100010001]$



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Question

1. A matrix $A = \begin{bmatrix} 2 & 5 \\ -11 & 7 \end{bmatrix}$, $(abjA)'$ is equal to

A. $\begin{bmatrix} -2 & -5 \\ 11 & -7 \end{bmatrix}$

B. $\begin{bmatrix} 7 & 5 \\ 11 & 2 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 11 \\ -5 & 2 \end{bmatrix}$

D. $\begin{bmatrix} 7 & -5 \\ 11 & 2 \end{bmatrix}$

Answer: C



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1. If d is the determinant of a square matrix A of order n , then the determinant of its adjoint is d^n (b) d^{n-1} (c) d^{n+1} (d) d



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2. If $[1 - \tan \theta \tan \theta 1][1 \tan \theta - \tan \theta 1]^{-1} = [a - b$
 $b \quad a]$, then $a = 1, b = 1$ (b)

$$a = \cos 2\theta, \quad b = \sin 2\theta \quad (c)$$

$$a = \sin 2\theta, \quad b = \cos 2\theta \quad (d) \text{ none of these}$$

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3. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ a & b & 2 \end{bmatrix}$, then $aI + bA + 2A^2$

equals A (b) A (c) abA (d) none of these

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