MATHS

BOOKS - MAXIMUM PUBLICATION

DETERMINANTS

Example

1. Using properties of determinants prove

$$\begin{vmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{vmatrix} = -2\left(x^3+y^3\right)$$

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2. If a,b,c are real numbers and $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$,show that a=b=c

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3. solve using properties of determinants.

$$\begin{vmatrix} 2x-1 & x+7 & x+4 \\ x & 6 & 2 \\ x-1 & x+1 & 3 \end{vmatrix} = 0$$

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4. If $\begin{vmatrix} 3 & x \\ x & x \end{vmatrix} = \begin{vmatrix} -2 & 2 \\ 4 & 1 \end{vmatrix}$,find the value of x.

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

Calculate $|A|$

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

Show that

$A \times adjA = |A|I$

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

Find $|3A|$

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8. Using properties of determinants prove the following.

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

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9. Using properties of determinants prove the following.

$$\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$$

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10. If $\begin{vmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{vmatrix} = 40$, then $\begin{vmatrix} 1 & 4 & 3 \\ -3 & -1 & 5 \\ 2 & 2 & 2 \end{vmatrix} =$

A. 0

B. -40

C. 40

D. 2

Answer:

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11. Calculate $\begin{vmatrix} 3 & -3 & 2 \\ 12 & -1 & 2 \\ 9 & 5 & 2 \end{vmatrix} =$

A. 120

B. 40

C. -40

D. 0

Answer:

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12. Show that

$$\Delta = \begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$$

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13. Find x if $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$

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14. S.T

$$\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = x^2(x+a+b+c)$$

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15. Prove that $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix}$

$= 2abc(a+b+c)^3$

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16. Let the value of a determinant is Δ.

Then the value of a determinant obtained by interchanging two rows is

A. Δ

B. $-\Delta$

C. 0

D. 1

Answer:

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17. Show that

$$\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$$

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18. Test the consistency

$$3x - y - 2z = 2, 2y - z = -1, 3x - 5y = 3$$

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19. Consider the system of equations

$2x - 3y = 7$

and $3x + 4y = 5$

Express the system in AX=B form.

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20. Consider the system of equations

$2x - 3y = 7$

and $3x + 4y = 5$

Find adjA

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21. Consider the system of equations

$2x - 3y = 7$

and $3x + 4y = 5$

Solve the system of equations.

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22. If A and B are matrices of order 3 such

that $|A| = -1, |B| = 3$, then $|3AB|$ is

A. -9

B. -27

C. -81

D. 9

Answer:

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23. 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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24. Consider the determinant

$$\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix},$$

Where x,y,z are different.

Express the above determinant as sum of two determinants.

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25. Consider the determinant

$$\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix},$$

Where x,y,z are different.

Show that if $\Delta = 0$,then$1 + xyz = 0$

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26. The value of the determinant

$$\begin{vmatrix} \sin 10 & -\cos 10 \\ \sin 80 & \cos 80 \end{vmatrix}$$ is

A. -1

B. 1

C. 0

D. -2

Answer:

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27. Using properties of determinants,

show that

$$\begin{vmatrix} a & a^2 & b+c \\ b & b^2 & c+a \\ c & c^2 & a+b \end{vmatrix} = (b-c)(c-a)(a-b)(a+b+c)$$

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28. Choose the correct answer from the bracket.Consider a sqare matrix of order 3.Let C_{11}, C_{12}, C_{13} are cofactors of the elements a_{11}, a_{12}, a_{13} respectively,then $a_{11}C_{11} + a_{12}C_{12} + a_{13}C_{13}$ is

A. 0

B. $|A|$

C. 1

D. none of these

Answer:

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29. Verify $A(adjA) = (adjA)A = |A|I$ for the matrix $A = \begin{bmatrix} 5 & -2 \\ 3 & -2 \end{bmatrix}$ that,where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

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30. Consider the following system of equations

$x + 2y = 4, 2x + 5y = 9$

If $A = \begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix}$,find$|A|$

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31. Consider the following system of equations

$x + 2y = 4, 2x + 5y = 9$

Express the above system of equations in the form $AX = B$

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32. Consider the following system of equations

$x + 2y = 4, 2x + 5y = 9$

Find $adjA$, A^{-1}

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33. Consider the following system of equations

$x + 2y = 4, 2x + 5y = 9$

Solve the system of equations.

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34. Consider the point

$A(-2, -3), B(3, 2), C(-1, -8)$

Find the area of ΔABC

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35. Consider the point A(-2,-3),B(3,2),C(-1,-8)

Find third vertex of any other triangle with same area and base AB

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36. Find the inverse of the following

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

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37. Find the inverse of the following

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

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38. Find the inverse of the following

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

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39. Find the inverse of the following

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

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40. Consider the system of equations

$5x + 2y = 4, 7x + 3y = 5$.If $A = \begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$, X=[[x], [y]]

and $B = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$

Find $|A|$

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41. Consider the system of equations

$5x + 2y = 4, 7x + 3y = 5$.If $A = \begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$, X=[[x], [y]]

and $B = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$

Find A^{-1}

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42. Consider the system of equations

$5x + 2y = 4, 7x + 3y = 5$.If $A = \begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$,

$X = \begin{bmatrix} x \\ y \end{bmatrix}$

and $B = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$

Solve the above system of equations.

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43. Let A be a square matrix of order 'n'

then $|KA| =$

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44. Find x if $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$

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45. Choose the correct answer from the bracket.The value of the determinant

$$\begin{vmatrix} 0 & p-q & p-r \\ q-p & 0 & q-r \\ r-p & r-q & 0 \end{vmatrix}$$ is

A. p+q+r

B. 1

C. 0

D. 3pqr

Answer:

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46. Consider $\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix}$

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47. Let $\begin{vmatrix} 1 & 3 & 2 \\ 2 & 0 & 1 \\ 3 & 4 & 3 \end{vmatrix} = 3$,then what is the value of $\begin{vmatrix} 1 & 3 & 2 \\ 4 & 0 & 2 \\ 3 & 4 & 3 \end{vmatrix} =$ and $\begin{vmatrix} 6 & 7 & 6 \\ 2 & 0 & 1 \\ 3 & 4 & 3 \end{vmatrix} =$

(Hint: Use the properties of determinants)

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48. Using properties of determinants show that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$

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

Find $|A|$

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

Find $adjA$.

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

is A singular?

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

Find adjA.

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

Obtain A^{-1}.

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

Using A^-1 solve the system of

equations

$x - y + z = 4$

$2x + y - 3z = 0$

$x + y + z = 2$

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55. Solve the following system of linear

equations.

$x + y + z = 3,$

$y - z = 0,$

$2x - y = 1$

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56. Solve the following system of linear equations.

$x + 2y + 5z = 10,$

$x - y - z = -2,$

$2x + 3y - z = -11$

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57. If $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Find $f(-x)$

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58. Solve the following system of linear equations.

$x + 2y + 5z = 10,$

$x - y - z = -2,$

$2x + 3y - z = -11$

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59. Solve the following system of linear equations.

$x + y + z = 3,$

$y - z = 0,$

$2x - y = 1$

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60. If $A = \begin{bmatrix} 2 & 3 \\ 1 & -2 \end{bmatrix}$ and $A^{-1} = kA$,then the value of 'k' is

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

Find A^2

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

Show that $A^2 = A^{-1}$

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63. Arjun' purchased 3 pens,2 purses and 1 instrument box and pays Rs. 410. From the same shop 'Deeraj' purchases 2 pens,1 purse and 2 instrument boxes and pays Rs.290, while 'Sindhu' purchases 2pens,2 purses,2 instrument boxes and pays Rs. 440. Translate the equation into system of linear equations.

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64. Arjun' purchased 3 pens,2 purses and 1 instrument box and pays Rs. 410.From the

same shop 'Deeraj' purchases 2 pens,1 purse and 2 instrument boxes and pays Rs.290,while 'Sindhu' purchases 2pens,2 purses,2 instrument boxes and pays Rs. 440.

The cost of one pen,one purse and one instrument box using matrix method.

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

Find A^{-1}

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

Using it solve the system of equations

$2x - 3y + 5z = 16$

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

$x + y - 2z = -3$

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67. Consider the following system of equations

$x + y + 3z = 5$

$x + 3y - 3z = 1$

$-2x - 4y - 4z = -10$

Convert the given system in the form $AX = B$

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68. Consider the following system of equations

$x + y + 3z = 5$

$x + 3y - 3z = 1$

$-2x - 4y - 4z = -10$

Find A^{-1}

Watch Video Solution

69. Consider the following system of equations

$x + y + 3z = 5$

$x + 3y - 3z = 1$

$-2x - 4y - 4z = -10$

Hence solve the system of equations.

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70. Solve the following system of equations by matrix method

$x + 2y + 5z = 10$

$x - y - z = -2$ ’2x+3y-z=-11`

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

Find $|A|$

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

Find A^{-1}

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

Solve the linear equations

$3x - 2y + 3z = 8$

$2x + y - z = 1$

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

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74. If $\begin{bmatrix} 2 & 5 \\ -3 & 7 \end{bmatrix} \times A = \begin{bmatrix} 17 & -1 \\ 47 & -13 \end{bmatrix}$ then

Find the 2x2 matrix A.

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75. If $\begin{bmatrix} 2 & 5 \\ -3 & 7 \end{bmatrix} \times A = \begin{bmatrix} 17 & -1 \\ 47 & -13 \end{bmatrix}$ then Find A^2.

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76. Prove that $\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix} = 4!$

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77. Using properties of determinants prove the following.

$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = (a-b)(b-c)(c-a)$$

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78. Using properties of determinants prove the following.

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$$

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79. Using properties of determinants prove the following.

$$\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1 - x^3\right)^2$$

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80. Consider the matrix $A = \begin{bmatrix} 2 & 5 \\ 3 & 2 \end{bmatrix}$

Find $adj(A)$

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81. Consider the matrix $A = \begin{bmatrix} 2 & 5 \\ 3 & 2 \end{bmatrix}$

Find A^{-1}

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82. Consider the matrix $A = \begin{bmatrix} 2 & 5 \\ 3 & 2 \end{bmatrix}$

Using A^{-1} solve the system of linear

equations $2x + 5y = 1,3x + 2y = 7$

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83. Consider the matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$

Using the column operation

$C_1 \to C_1 + C_2 + C_3$,

show that $|A| = (a+b+c)\begin{vmatrix} 1 & b & c \\ 1 & c & a \\ 1 & a & b \end{vmatrix}$

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84. Consider the matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$

show that $|A| = -\left(a^3 + b^3 + c^3 - 3abc\right)$

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85. Consider the matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$

Find $A \times adj(A)$ if a=1, b=10, c=100`

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

what is the value of $|3A|$?

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87. Find the equation of the line joining the points(1,2) and (-3,-2) using determinants.

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88. Show that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

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89. Consider the following system of linear equations, $x + y + z = 6, x - y + z = 2,$ $2x + y + z = 1$

Express this system of equations in the standard form $AX = B$

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90. Consider the following system of linear equations, $x + y + z = 6, x - y + z = 2,$ $2x + y + z = 1$

Prove that A is non-singular.

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91. Consider the following system of linear equations, $x + y + z = 6, x - y + z = 2,$ $2x + y + z = 1$

Find the value of x,y and z satisfying the above equation.

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92. If $\begin{vmatrix} x & 3 \\ 5 & 2 \end{vmatrix} = 5$,then x=.....

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93. Prove that

$$\begin{vmatrix} y+k & y & y \\ y & y+k & y \\ y & y & y+k \end{vmatrix} = k^2(3y+k)$$

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94. Solve the following system of linear

Equations,using matrix method,

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

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95. Let B is a square matrix of order 5, then $|kB|$ is equal to....

A. $|B|$

B. $k|B|$

C. $k^5|B|$

D. $5|B|$

Answer:

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96. Prove that

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$$

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97. Check the consistency of the following equations,

$2x + 3y + z = 6, x + 2y - z = 2,$

$7x + y + 2z = 10$

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98. Find the values of x in which

$$\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$$

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99. Using the property of determinants,show that the points $A(a, b+c), B(b, c+a), C(c, a+b)$ are collinear.

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100. Examine the consistency of system of following equations:

$5x - 6y + 4z = 15$

$7x + y - 3z = 19$

$2x + y + 6z = 46$

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101. Consider a system of linear equations which is given below,

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1,$$
$$\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2.$$

Express the above equation in the matrix form

$AX = B$.

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102. Consider a system of linear equations

which is given below,

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1,$$
$$\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$$

Find A^{-1}.

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103. Consider a system of linear equations

which is given below,

$$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4, \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1,$$
$$\frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2$$

Find x,y and z.

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104. Consider the matrices $A=\begin{bmatrix}2 & 3\\ 4 & 5\end{bmatrix}$

Prove that $A^2-7A-2I=0$

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105. Consider the matrices $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

Hence find A^{-1}

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106. Consider the matrices $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

Solve the following system of equations

using matrix method $2x + 3y = 4, 4x + 5y = 6$

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107. Let A be a square matrix of order 2x2

then $|KA|$ is equal to

A. $K|A|$

B. $K^2|A|$

C. $K^3|A|$

D. $2K|A|$

Answer:

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108. Prove that

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

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109. Examine the consistency of the system

of Equations.

$5x + 3y = 5, 2x + 6y = 8$

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110. Choose the correct statement related to the matrices $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

A. $A^3 = A, B^3 \neq B$

B. $A^3 \neq A, B^3 = B$

C. $A^3 = A, B^3 = B$

D. $A^3 \neq A, B^3 \neq B$

Answer:

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111. If $M = \begin{bmatrix} 7 & 5 \\ 2 & 3 \end{bmatrix}$,then verify the equation

$M^2 - 10M + 11I_2 = 0$

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112. Inverse of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 0 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$

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113. Solve the system of Linear equations

$x + 2y + z = 8, 2x + y - z = 1, x - y + z = 2$

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114. If $\begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix} = 15$,then find the value of x.

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115. Solve the following system of equations

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

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

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116. The value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 1 & 1 & -1 \end{vmatrix}$ is

A. -4

B. 0

C. 1

D. 4

Answer:

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117. Using matrix method,solve the system

of linear equations

$x + y + 2z = 4, 2x - y + 3z = 9,$

$3x - y - z = 2$

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118. If $A = \begin{bmatrix} a & 1 \\ 1 & 0 \end{bmatrix}$ is such that $A^2 = I$ then a

equals

A. 1

B. -1

C. 0

D. 2

Answer:

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119. Solve the system of equations

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

Using matrix method

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120. If A is a 2×2 matrix with $|A| = 5$, then $adj[adjA]$ is

A. 5

B. 25

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

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

Answer:

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121. Solve the system of equations using

matrix method.

$x + y + z = 1, 2x + 3y - z = 6,$

$x - y + z = -1$

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