MATHS

BOOKS - MODERN PUBLICATION

DETERMINANTS

Problem

1. If $\begin{bmatrix} 2 & 4 \\ k & 6 \end{bmatrix} = 0$, what is the value of k ?

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2. If $\begin{bmatrix} a_1 & b_1 \\ c_1 & d_1 \end{bmatrix} = k \begin{bmatrix} a_1 & c_1 \\ b_1 & d_1 \end{bmatrix}$ then what is the value of k ?

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3. If $A = \begin{pmatrix} 1 & 0 & 2 \\ 5 & 1 & x \\ 1 & 1 & 1 \end{pmatrix}$ is a singular matrix the, what is the value of x ?

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4. For what k, $x - ky = 0$

$kx - y - z = 0$

$x + y - z = 0$

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5. Evaluate $[[-6, 0, 0], [3, -5, 7], [2, 8, 11]]$

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6. Evaluate $\begin{bmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{bmatrix}$

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7. Find x if $\begin{bmatrix} a & b & c \\ b & a & c \\ x & b & c \end{bmatrix} = 0$

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8. Solve the following : $\begin{bmatrix} 1+x & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+x \end{bmatrix}$ =0

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9. Solve the following : $\begin{bmatrix} 2 & 2 & x \\ -1 & x & 4 \\ 1 & 1 & 1 \end{bmatrix}$ =0

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10. Is $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ invertible, justify ?

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11. Evaluate the following determinants:

$$\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$$

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12. Prove the following:

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

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13. If Aand B are square matrices of order 3, such that

$|A| = -1, |B| = 3 then |3AB|$ = _____

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14. For what k

$x + 2y - 3z = 2$

$(k + 3)z = 3$ (2k+1) +z = 2 is inconsistent ?`

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15. The sum of two non integral roots of $\begin{bmatrix} x & 2 & 5 \\ 3 & x & 3 \\ 5 & 4 & x \end{bmatrix} = 0 is$ _ _ _ .

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16. What is the inverse of $A = \begin{pmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & -\cos\alpha \end{pmatrix}$

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17. The value of $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 5 & 2 \\ 8 & 14 & 20 \end{bmatrix}$ is _____.

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18. Solve the following : $\begin{bmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{bmatrix}$=0

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19. Prove that the following. $\begin{bmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{bmatrix}$=4ab

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20. Solve : $\begin{bmatrix} 7 & 6 & x \\ 2 & x & 2 \\ x & 3 & 7 \end{bmatrix} = 0$

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21. Solve the following : $\begin{bmatrix} 1+x & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+x \end{bmatrix}$ =0

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22. Prove that the following.

$$\begin{bmatrix} a & b & c \\ x & y & z \\ p & q & r \end{bmatrix} = \begin{bmatrix} y & b & q \\ x & a & p \\ z & c & r \end{bmatrix} = \begin{bmatrix} x & y & z \\ p & q & r \\ a & b & c \end{bmatrix}$$

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23. Prove that the following.

$$\begin{bmatrix} a+d & a+d+k & a+d+c \\ c & c+b & c \\ d & d+k & d+c \end{bmatrix}$$ =abc

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24. Prove that the following. $\begin{bmatrix} 1 & 1 & 1 \\ b+c & c+a & c+a \\ b^2+c^2 & c^2+a^2 & a^2+b^2 \end{bmatrix}$

=(b-c)(c-a)(a-b)

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25. Prove that $\begin{bmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{bmatrix} = 0$

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26. 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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27. Show 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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28. Prove that $\begin{bmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{bmatrix}$

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29. Prove that the following.

$$\begin{bmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{bmatrix} = 2\begin{bmatrix} a & b & c \\ p & q & r \\ x & y & z \end{bmatrix}$$

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30. Prove that the following. $\begin{bmatrix} 1 & 1 & 1 \\ b+c & c+a & c+a \\ b^2+c^2 & c^2+a^2 & a^2+b^2 \end{bmatrix}$

=(b-c)(c-a)(a-b)

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31. Factorize the following. $\begin{bmatrix} a & b & c \\ b+c & c+a & a+b \\ a^2 & b^2 & c^2 \end{bmatrix}$

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32. Prove the following : $\begin{bmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{bmatrix} = \left(1-x^3\right)^2$

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33. Prove that the following.

$$\begin{bmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ca & cb & a^2+b^2 \end{bmatrix} = 4a^2b^2c^2$$

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34. Prove that

$$\begin{bmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{bmatrix} = 1 + a^2 + b^2 + c^2$$ and hence

show that its maximum value = 1`

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35. Show that

$$\begin{bmatrix} 3a & -a+b & -a+c \\ -b+a & 3b & -b+c \\ -c+a & -c+b & 3c \end{bmatrix} = 3(a+b+c)(ab+bc+ca)$$

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36. Show that the homogenous system of equations

$x - 2y + z = 0 x + y - z = 0$

$3x + 6y - 5z = 0$

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37. Prove that the following.

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

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38. Examining consistency and solvability, solve the following equation by matrix method.

2x-y+z=4

x+3y+2z=12

3x+2y+3z=16

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39. Prove the following:

$$\begin{bmatrix} (b+c)^2 & a^2 & bc \\ (c+a)^2 & b^2 & ca \\ (a+b)^2 & c^2 & ab \end{bmatrix}$$

$$=\left(a^2+b^2+c^2\right)(a+b+c)(b-c)(c-a)(a-b)$$

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40. Prove the following:

$$\begin{bmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{bmatrix}$$

=2(b+c)(c+a)(a+b)

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41. Prove the following:

$$\begin{vmatrix} ax-by-cz & ay+bx & az+cx \\ bx+ay & by-cz-ax & bz+cy \\ cx+az & ay+bz & cz-ax-by \end{vmatrix}$$

$$=\left(a^2+b^2+c^2\right)(ax+by+cz)\left(x^2+y^2+z^2\right)$$

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42. If $\begin{bmatrix} x & x^2 & x^3-1 \\ y & y^2 & y^3-1 \\ z & z^2 & z^3-1 \end{bmatrix} = 0$

then prove that xyz=1 when x,y,z are non zero and unequal.

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43. If x,y,z are positive and are the pth, qth and rth terms of

a G.P. then prove that

$$\begin{vmatrix} \log x & p & 1 \\ \log y & q & 1 \\ \log z & r & 1 \end{vmatrix} = 0$$

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44. If 2s=a+b+c show that

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

$$2s^3(s-a)(s-b)(s-c)$$

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