MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

DETERMINANTS - FOR BOARDS

Solved Examples

1. Evaluate: $\begin{vmatrix} 219 & 117 & 345 \\ 19 & 9 & 34 \\ 7 & 3 & 6 \end{vmatrix}$

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

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4. if a,b,c are in A.P. show that : $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$

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5. Using properties of determinants, prove the following:

$|3\mathrm{a} - \mathrm{a} + \mathrm{b} - \mathrm{a} + \mathrm{ca} - \mathrm{b}3\mathrm{bc} - \mathrm{ba} - \mathrm{cb} - \mathrm{c}3\mathrm{c}| = 3(\mathrm{a} + \mathrm{b} + \mathrm{c})(\mathrm{a\,b} + \mathrm{b\,c} +$

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6. Using properties of determinants, solve for

$x : |a + xa - xa - xa - xa + xa - xa - xa - xa + x| = 0$

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7. 15. Using properties of determinants, prove the following

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

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8. Prove that $\begin{vmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta+\gamma & \gamma+\alpha & \beta+\alpha \end{vmatrix} = (\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$

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9. If $\begin{vmatrix} x^3+1 & x^2 & x \\ y^3+1 & y^2 & y \\ z^3+1 & z^2 & z \end{vmatrix} = 0$ and x, y, z are all different then prove that $xyz = -1$

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10. Evaluate: $\triangle \begin{vmatrix} 1+a_1 & a_2 & a_3 \\ a_1 & 1+a_2 & a_3 \\ a_1 & a_2 & 1+a_3 \end{vmatrix}$

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11. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

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12. Let a, b, c be positive and not all equal. Show that the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is negative .

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13. Using properties of determinants, prove that

$|aa+ba+b+c2a3a+2b4a+3b+2c3a6a+3b10a+6b+3c| = a^3$

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14. Using properties of determinants. Prove that

$|11+p1+p+q23+2p4+3p+2q36+3p10+6p+3q| = 1$

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15. Prove that

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

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16. Prove that $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} = 1+a^2+b^2+c^2$

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17. 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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18. If $2s = a+b+c$ and $A = \begin{vmatrix} a^2 & (s-a)^2 & (s-a)^2 \\ (s-b)^2 & b^2 & (s-b)^2 \\ (s-c)^2 & (s-c)^2 & c^2 \end{vmatrix}$ then det

A

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19. Prove $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix}$=$(ab+bc+ca)^2$

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20. Prove that:

$$|-2aa+ba+cb+a-2+\ +ac+b-2c| = 4(a+b)(b+c)(c+a)$$

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21. Prove that: $\begin{vmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$

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22. Solve the equation: $\begin{vmatrix} 15-x & 1 & 10 \\ 11-3x & 1 & 16 \\ 7-x & 1 & 13 \end{vmatrix} = 0$

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23. If a+b+c=0, solve the equation: $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$

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24. Find the area of the triangle whose vertices are (3,8), (-4,2) and (5, -1).

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25. If A $(x, y), B(1, 2)$ and $C(2, 1)$ are the vertices of a triangle of area 6 square units, show that $x + y = 15$ or -9

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26. Examine whether points $(-8, 3), (2, -2)$ and $(-4, 1)$ are collinear or not.

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27. (i) Find equation of line joining (1,2) and (3,6) using determinants, (ii) Find equation of line joining (3, 1) and (9,3) using determinants.

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Exercise

1. Evaluate the following: $\begin{vmatrix} 7 & 5 \\ -2 & 3 \end{vmatrix}$

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2. Evaluate the following: $\begin{vmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{vmatrix}$

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3. Evaluate the following: $\begin{vmatrix} \tan\alpha & \cos ec\alpha \\ \sin\alpha & \cot\alpha \end{vmatrix}$

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4. Evaluate the following: $|\cos\theta, \ -\sin\theta], [\sin\theta, \cos\theta]|$

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5. Evaluate the following: $\left|\frac{1}{2}, \frac{1}{5}\right], \left[\frac{1}{2}, \frac{1}{7}\right|$

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6. Evaluate the following: $\begin{vmatrix} x^2 - x + & x - 1 \\ x + 1 & x + 1 \end{vmatrix}$

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7. Evaluate: $|a + ibc + id - c + ida - ib|$

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8. Evaluate the following: $\left|\frac{1}{2}, 8\right], [4, 2]$

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9. If $A = [1242]$, then show that $|2A| = 4|A|$.

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10. If $A = \begin{bmatrix} 2 & 4 \\ -5 & -1 \end{bmatrix}$ show that: $|3A| = 9|A|$

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11. Write the minor and cofactor of each element of second column in the following determinants and evaluate them: $\begin{vmatrix} 4 & 9 & 7 \\ 3 & 5 & 7 \\ 5 & 4 & 5 \end{vmatrix}$

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12. Write the minor and cofactor of each element of second column in the following determinants and evaluate them: $\begin{vmatrix} 1 & 2 & 4 \\ 1 & 3 & 9 \\ 1 & 4 & 16 \end{vmatrix}$

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13. Find the cofactor of a_{12} in $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 4 & 5 & -7 \end{vmatrix}$

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14. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case: $\begin{vmatrix} 5 & -10 \\ 0 & 3 \end{vmatrix}$

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15. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case: $\begin{vmatrix} 1 & 3 & -2 \\ 4 & -5 & 6 \\ 3 & 5 & 2 \end{vmatrix}$

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16. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case: $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$

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17. Evaluate the following: $\begin{vmatrix} 1 & 5 & 7 \\ 6 & 7 & 2 \\ 1 & 2 & 3 \end{vmatrix}$

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18. Evaluate the following: $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$

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19. Evaluate the following: $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$

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20. Evaluate the following: $\begin{vmatrix} 43 & 3 & 6 \\ 35 & 21 & 4 \\ 17 & 9 & 2 \end{vmatrix}$

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21. Evaluate the following: $\begin{vmatrix} 9 & 9 & 12 \\ 1 & 3 & -4 \\ 1 & 9 & 12 \end{vmatrix}$

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22. Evaluate the following: $\begin{vmatrix} 42 & 1 & 6 \\ 28 & 7 & 4 \\ 14 & 3 & 2 \end{vmatrix}$

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23. Evaluate the following: $\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$

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24. Evaluate the following: $\begin{vmatrix} 2 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

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25. Evaluate the determinants $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

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26. Evaluate the following: $\begin{vmatrix} 0 & 1 & 2 \\ -1 & 0 & -3 \\ -2 & 3 & 0 \end{vmatrix}$

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27. Evaluate the determinant $\Delta = \begin{vmatrix} 1 & 2 & 4 \\ -1 & 3 & 0 \\ 4 & 1 & 0 \end{vmatrix}$

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28. Evaluate the following: If $A = \begin{bmatrix} 1 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{bmatrix}$ find |A|

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29. If $A = [101012004]$, then show that $|3A| \quad = \quad 27|A|$

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30. Evaluate the following: $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$

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31. Evaluate the following: $\begin{vmatrix} 1 & 1 & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$

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32. Evaluate the following: $\begin{vmatrix} x+\lambda & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda \end{vmatrix}$

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33. Evaluate the following: $\begin{vmatrix} 1 & a & a^2-bc \\ 1 & b & b^2-ac \\ 1 & c & c^2-ab \end{vmatrix}$

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34. Evaluate the following: $\begin{vmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & gama\alpha & \alpha\beta \end{vmatrix}$

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35. Evaluate the following: $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$

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36. Evaluate the following $\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix}$

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37. Evaluate the following: $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix}$

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38. Evaluate the following: $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$

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39. Evaluate the following: $\begin{vmatrix} 0 & ab^2 & ac^2 \\ a^2b & 0 & bc^2 \\ a^2c & cb^2 & 0 \end{vmatrix}$

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40. Evaluate the following: $\begin{vmatrix} 1 & x & y \\ 1 & x+y & y \\ 1 & x & x+y \end{vmatrix}$

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41. Evaluate the following: $\left|\left[a, b+c, a^2\right], [b, c+a, b62], \left[c, a+bc^2\right]\right|$

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42. Evaluate the following: $\begin{vmatrix} b+c & a-b & a \\ c+a & b-c & b \\ a+b & c-a & c \end{vmatrix}$

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43. Evaluate the following: $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$

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44. Evaluate $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & \omega & \omega \end{vmatrix}$ where ω is cube root of unity.

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45. If a,b,c are in A.P. find the value of:

$| \, | \, 2y+4, 5y+7, 8y+a], [3y+5, 6y+8, 9y+b], [4y+6, 7y+9, 10y+c$

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46. Evaluate: $\begin{bmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{bmatrix}$

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47. factorise: $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix}$

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48. For a fixed positive integer n prove that:

$$D = \begin{vmatrix} n! & (n+1)! & (n+2)! \\ (n+1)! & (n+2)! & (n+3)! \\ (n+2)! & (n+3)! & (n+4)! \end{vmatrix} = (n!)^3 (2n^3 + 8n^2 + 10n + 4)$$

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49. Prove that

$$\begin{vmatrix} 1 & a^2 + bc & a^3 \\ 1 & b^2 + ca & b^3 \\ 1 & c^2 + ca & c^3 \end{vmatrix} = -(a-b)(b-c)(c-a)(a^2 + b^2 + c^2)$$

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50. Q. $\begin{vmatrix} x+y & x & x \\ 15x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$

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51. Prove that

$$\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2(a+b+c)\left(ab+bc+ca-a^2-b^2-c^2\right).$$

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52. Using properties of determinant prove that: |[1,x+y, x^2+y^2],[1, y+z, y^2+z^2],[1, z+x, z^2+x^2]|= (x-y)(y-z)(z-x) `

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53. 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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54. Prove that

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

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55. Prove that $\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} = (x+y+z)(x-z)^2$

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56. Using properties of determinants, prove the following: $|1 \times^2 x^2 1 \times x^2 1| = \left(1-x^3\right)^2$

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

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58. Prove that $\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} = (x+y+z)(x-z)^2$

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59. Prove that

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

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60. Prove that

$$\begin{vmatrix} a^2 & a^2-(b-c)^2 & bc \\ b^2 & b^2-(c-a)^2 & ca \\ c^2 & c^2-(a-b)^2 & ab \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)\left(a^2+b^2+c^2\right)$$

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61. Using properties of determinants, prove that:

$$\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2$$

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62. $\begin{bmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{bmatrix} = \left(b^2-ac\right)\left(ax^2+2bxy+cy^2\right)$

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63. Prove that:

$$2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = \left[(a-b)^2 + (b-c)^2 + (c-a)^2\right]$$

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64. Prove that $\begin{vmatrix} \cos\alpha\cos\beta & \cos\alpha\sin\beta & \sin\alpha \\ -\sin\beta & \cos\beta & 0 \\ \sin\alpha\cos\beta & \sin\alpha\sin\beta & \cos\alpha \end{vmatrix} = \cos 2\alpha$

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65. Prove that $\triangle \begin{vmatrix} a+bx & c+dx & p+qx \\ -ax+b & cx+d & px+q \\ u & v & w \end{vmatrix} = (1-x^2)\begin{bmatrix} a & c & p \\ b & d & q \\ u & v & w \end{bmatrix}$

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66. Show that $\begin{vmatrix} \sin\alpha & \cos\alpha & \cos(\alpha+\delta) \\ \sin\beta & \cos\beta & \cos(\beta+\delta) \\ \sin\gamma & \cos\gamma & \cos(\gamma+\delta) \end{vmatrix} = 0$

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67. If $\triangle = \begin{vmatrix} \sin\alpha & \cos\alpha & \sin(\alpha+\delta) \\ \sin\beta & \cos\beta & \sin(\beta+\delta) \\ \sin\gamma & \cos\gamma & \sin(\gamma+\delta) \end{vmatrix}$ then prove that $\triangle$ is independent of alpha, beta, gamma and delta.

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68. Prove that $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is independent of theta

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69. Prove that $\begin{bmatrix} x & x^2 & 1+px^3 \\ y & y^2 & 1+py^3 \\ z & z^2 & 1+pz^3 \end{bmatrix} = (1+pxyz)(x-y)(y-z)(z-x)$

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70. Show without expanding at any stage that:

$$\left[\frac{1}{a}, a^2, bc\right], \left[\frac{1}{b}, b^2, ca\right], \left[\frac{1}{c}, c^2, ab\right] \mid = 0$$

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71. Show without expanding at any stage that:

$$[1, a, b+c], [1, b, c+a], [1, c, a+b] \mid = 0$$

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72. Show without expanding at any stage that:

$$\left[\frac{1}{a}, a, bc\right], \left[\frac{1}{b}, b, ca\right], \left[\frac{1}{c}, c, ab\right] \mid = 0$$

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73. Show without expanding at any stage that: $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0$

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74. Show without expanding at any stage that:

$[x+y, y+z, z+x], [z, x, y], [1, 1, 1] \mid = 0$

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75. Show without expanding at any stage that:

$[x, a, x+a], [y, b, y+b], [z, c, z+c] \mid = 0$

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76. Using the property of determinants and without expanding, prove that $\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix} = 0$

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77. Show without expanding at any stage that:

$$[a+b, b+c, c+a], [b+c, c+a, a+b], [c+a, a+b, b+c]| = 2|[a, b, c],$$

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78. Show without expanding at any stage that:

$$[0, \sin\alpha - \cos\alpha], [-\sin\alpha, 0, \sin\beta], [\cos\alpha s - \sin\beta, 0] \mid = 0$$

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79. Show without expanding at any stage that:

$$[0, a, -b], [-a, 0, -c], [b, c, 0] \mid = 0$$

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80. Show without expanding at any stage that:

$$\begin{vmatrix} 1 & \cos\alpha - \sin\alpha & \cos\alpha + \sin\alpha \\ 1 & \cos\beta - \sin\beta & \cos\beta + \sin\beta \\ 1 & \cos\gamma - \sin\gamma & \cos\gamma + \sin\gamma \end{vmatrix} = 2 \begin{vmatrix} 1 & \cos\alpha & \sin\alpha \\ 1 & \cos\beta & \sin\beta \\ 1 & \cos\gamma & \sin\gamma \end{vmatrix}$$

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81. Show without expanding at any stage that:

$$\left[(a-1)^2, a^2+1, a\right], \left[(b-1)^2, b^2+1, b\right], \left[(c-1)^2, c^2+1, c\right] \mid = 0$$

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82. Show without expanding at any stage that:

$$\det \begin{bmatrix} a & b & c \\ a+2x & b+2y & c+2z \\ x & y & z \end{bmatrix} = 0$$

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83. Show without expanding at any stage that:

$$[1, a, bc], [1, b, ca], [1, c, ab]| = |\left[1, a, a^2\right], \left[1, b, b^2\right], \left[1, c, c^2\right]|$$

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84. Show without expanding at any stage that:

$$\left[a, a^2, bc\right], \left[b, b^2, ca\right], \left[c, c^2, ab\right]| = |\left[1, a^2, a^3\right], \left[1, b^2, b^3\right], \left[1, c^2, c^3\right]|$$

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85. Solve the equation: $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$

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86. Solve the equation: $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$

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87. Solve the equation: $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$

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88. Solve the equation: $\begin{vmatrix} a & a & x \\ a & a & a \\ b & x & b \end{vmatrix} = 0$

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89. Solve the equation: $\begin{vmatrix} x & 2 & 3 \\ 4 & x & 1 \\ x & 2 & 5 \end{vmatrix} = 0$

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90. Solve the equation: $\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = 0$

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91. Solve the equation: $\begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix} = 0$

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92. Find the area of the triangle whose vertices are: $(-2, 4), (2, -6), (5, 4)$

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93. Find area the triangle with at the point given in each of the following (2,7),(1,1) (10,8)

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94. Find the area of the triangle whose vertices are: $(1, 0), (6, 0), (4, 3)$

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95. Find the area of the triangle whose vertices are: $(-2, -3), (3, 2), (-1, -8)$

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96. Find the area of the triangle whose vertices are: $(-3, 2), (5, 4), (7, -6)$

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97. Find the area of the triangle whose vertices are: $(1, 4), (2, 3), (-5, -3)$

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98. Find the area of the triangle whose vertices are: $(3, 1), (4, 3), (-5, 4)$

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99. Find the area of the triangle whose vertices are: $(2, 8), (-4, 2), (5, 1)$

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100. Find the value of x if the area of triangle is 35 sq. units whose vertices are (x,4),(2,-6),(5,4).

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101. Prove that the area of the triangle whose vertices are $(t, t-2), (t+2, t+2) and (t+3, t)$ is independent of t.

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102. Find the values of k if area of triangle is 4 sq. units and vertices are: (-2,0),(0,4)(0,k)`

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103. Find the values of k if area of triangle is 4 sq. units and vertices are:

$(k, 0), (0, 2)(4, 0)$

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104. Examine whether the points are collinear or not: (2,5),(-5,-2),(-1,2)

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105. Examine whether the points are collinear or not: (-3,2),(-5,-4),(7,-6)

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106. Examine whether the points are collinear or not: (1,5),(2,-4),(3,3)

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107. Prove that the points (a+b+c),(b,c+a) and (c,a+b) are collinear.

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108. If the points $(a, b), (a_1, b_{10}$ and $(a - a_1, b - b_1)$ are collinear, show that $\frac{a}{a_1} = \frac{b}{b_1}$

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109. Show that the points $(a, 0), (0, b)$ and (x, y) are collinear if `x/a+y/b=1.

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110. For what values of k, the points (1,4), (k-2), and (-3,16) are colinear?

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111. Find the value of t for which the points (1,-1),(3,-3) and (t,2) lie on the same line (using determinants).

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112. Find the equation of the line joining A(1,3) and B (0,0) using determinants and find k if D(k, 0) is a point such that area of triangle ABD is 3sq units.

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