



## Topic List



নির্ণায়কের *Math solve* (Part – 02)



*medium Problem*

$$\begin{vmatrix} 1 & c & a & c+a+2b \end{vmatrix}$$

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

$$[C'_1 = C_1 + C_2 + C_3]$$

$$= 2(a+b+c) \begin{vmatrix} -(a+b+c) & 0 \\ a+b+c & -(a+b+c) \end{vmatrix}$$

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

$$= 2(a+b+c) \begin{vmatrix} 0 & -(a+b+c) & 0 \\ 0 & a+b+c & -(a+b+c) \\ 1 & a & c+a+2b \end{vmatrix}$$

$$\begin{bmatrix} r'_1 = r_1 - r_2 \\ r'_2 = r_2 - r_3 \end{bmatrix}$$

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

$$= 2(a+b+c)^3 \quad (A)$$

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

$$= \begin{vmatrix} a+b+c & a+b+c & a+b+c \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} \quad [r_1' = r_1 + r_2 + r_3]$$

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

$$= (a+b+c) \begin{vmatrix} 0 & 0 & 1 \\ a+b+c & -(a+b+c) & 2b \\ 0 & a+b+c & c-a-b \end{vmatrix}$$

$$= (a+b+c) \begin{vmatrix} (a+b+c) & -(a+b+c) \\ 0 & a+b+c \end{vmatrix} \quad \begin{matrix} [c_1' = c_1 - c_2] \\ [c_2' = c_2 - c_3] \end{matrix}$$

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

$$\begin{vmatrix} x^2 & yz & zx + z^2 \\ x^2 + xy & y^2 & zx \\ xy & y^2 + yz & z^2 \end{vmatrix} = 4x^2y^2z^2$$

$$= xyz \begin{vmatrix} x+z & y & x \\ y & y+z & z \\ x & z & 0 \end{vmatrix} \quad [C_3' = C_3 - (C_1 + C_2)]$$

$$= xyz \begin{vmatrix} x+z & y & x \\ y & y+z & z \\ x & z & 0 \end{vmatrix}$$

$$= xyz \begin{vmatrix} x & z & 0 \\ x+y & y & x \\ y & y+z & z \end{vmatrix}$$

$$= xyz \begin{vmatrix} x & z & 0 \\ x & -z & 0 \\ y & y+z & -2y \end{vmatrix} \quad [r_2' = r_2 - r_1]$$

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

$$= -2xyz(-xz - xz)$$

$$= -2xyz(-2xz) = 4xyz^2(A)$$

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

$$= \frac{1}{xy} \begin{vmatrix} ax+bx & bx+cy & ax+bx \\ bx & cy & bx+cy \\ ax+bx & bx+cy & 0 \end{vmatrix}$$

$$= \frac{1}{xy} \begin{vmatrix} ax & bx & 0 \\ bx & cy & 0 \\ ax+bx & bx+cy & -(bx+bx+cy) \end{vmatrix} \quad [c'_3 = c - (b-b)]$$

$$\begin{aligned} &= \frac{1}{xy} \begin{vmatrix} ax & bx \\ bx & cy \end{vmatrix} \begin{vmatrix} ax+bx & bx+cy \end{vmatrix} - \frac{1}{xy} \{ -(ax+bx+cy) \} \times (axcy - b^2xy) \\ &= \frac{1}{xy} \{ -(ax+bx+cy) \} \times (ac - b^2) \\ &= \frac{1}{xy} \{ -(ax+bx+cy) \} \times xy (ac - b^2) \\ &= -(ax+bx+cy) (b^2 - ac) \\ &= (b^2 - ac) (ax+bx+cy) \end{aligned}$$