

## Step-1

Big Formula

$$\det A = \sum_{\text{all } P's} (a_{1\alpha} a_{2\beta} \dots a_{m\mu}) \det P$$

By using big formula, we get

$$\det(a_{ij})_{3 \times 3} = a_{11}a_{22}a_{33} + a_{12}a_{23}a_{31} + a_{13}a_{21}a_{32} - a_{12}a_{21}a_{33} - a_{11}a_{23}a_{32} - a_{13}a_{22}a_{31}$$

## Step-2

a) If  $a_{11} = a_{22} = a_{33} = 0$ , four terms in the big formula are zeros.

They are  $a_{11}a_{22}a_{33}$ ,  $-a_{11}a_{23}a_{32}$ ,  $-a_{12}a_{21}a_{33}$ ,  $-a_{13}a_{22}a_{31}$

## Step-3

b) If  $a_{11} = a_{22} = a_{33} = a_{44} = 0$ , then zero terms in the big formula are

$$\begin{aligned} & a_{11}a_{22}a_{33}a_{44}, a_{12}a_{21}a_{33}a_{44}, a_{11}a_{24}a_{33}a_{42} \\ & a_{11}a_{22}a_{34}a_{43}, a_{11}a_{23}a_{32}a_{44}, a_{14}a_{22}a_{33}a_{41}, \\ & a_{13}a_{22}a_{31}a_{44}, a_{11}a_{23}a_{34}a_{42}, a_{11}a_{24}a_{32}a_{43}, \\ & a_{13}a_{22}a_{34}a_{41}, a_{14}a_{22}a_{31}a_{43}, a_{12}a_{24}a_{33}a_{41}, \\ & a_{14}a_{21}a_{33}a_{42}, a_{12}a_{23}a_{31}a_{44}, a_{13}a_{21}a_{32}a_{44} \end{aligned}$$

So, a total 15 terms vanish in the big formula.