

## Step-1

Consider the following matrix:

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

The new matrix  $\begin{pmatrix} a-mc & b-md \\ c-la & d-lb \end{pmatrix}$  is obtained by applying the two row operations

$$R_1 - mR_2 \rightarrow R_1 \text{ and } R_2 - lR_1 \rightarrow R_2 \text{ on } \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

## Step-2

Now, to find the determinant of the new matrix directly:

$$\begin{aligned} \begin{vmatrix} a-mc & b-md \\ c-la & d-lb \end{vmatrix} &= (a-mc) \cdot (d-lb) - (c-la) \cdot (b-md) \\ &= ad - alb - mcd + mclb - cb + cmd + lab - lamd \\ &= ad - cb + mclb - lamd \\ &= ad(1-lm) - cb(1-lm) \\ &= (ad-cb) \cdot (1-lm) \end{aligned}$$

Therefore, the determinant of the new matrix comes out to be  $\boxed{(ad-cb) \cdot (1-lm)}$ .