

Step-1

If (a,b) is a multiple of (c,d) with $abcd \neq 0$, then we have to show that (a,c) is a multiple of (b,d) .

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ has dependent rows, then we have to show that it has dependent columns.

Step-2

Let $(a,b) = (2,4)$ and $(c,d) = (1,2)$

Then it is clear that (a,b) is a multiple of (c,d) , since 2 times of (c,d) is (a,b)

And $(a,c) = (2,1), (b,d) = (4,2)$

From this, it is clear that $(a,c) = \frac{1}{2}(b,d)$

So (a,c) is a multiple of (b,d) .

Step-3

Now the matrix $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 2 & 4 \\ 1 & 2 \end{pmatrix}$

Here the first row is the two times of the second row, so the rows are dependent and, and from this we have the second column is the two times of the first column.

So we conclude that if A has dependent rows then it has dependent columns also.