

## Step-1

Given that the columns of a 5 by 5 matrix  $A$  are a basis for  $\mathbf{R}^5$ .

Hence the columns are linearly independent and span  $\mathbf{R}^5$ .

## Step-2

(a)

Since the columns of  $A$  are linearly independent, its determinant is nonzero and hence  $Ax = 0$  has only one solution  $x = 0$

So the equation  $Ax = 0$  has only one solution  $x = 0$  because the columns are independent (In fact  $A$  is invertible).

## Step-3

(b)

If  $b$  is in  $\mathbf{R}^5$  then  $Ax = b$  is solvable because the columns span  $\mathbf{R}^5$  and  $b$  can be expressed as the linear combination of the columns of  $A$ .