# Linearly Independent and Dependent:

The set of vectors  $\{\vec{v_1}, \vec{v_2}, ..., \vec{v_p}\}$   $\in \mathbb{R}^n$  is said to be linearly independent if the vector equation  $c_1\vec{v_1} + c_2\vec{v_2} + \cdots + c_p\vec{v_p} = 0$  has a trivial solution. ie, all  $c_p$ 's is equal to zero  $(c_1 = c_2 = \cdots = c_p = 0)$ 

The set of vectors  $\{\vec{v}_1, \vec{v}_2, \dots, \vec{v}_p\} \in \mathbb{R}^p$  is said to be linearly dependent if the vector equation  $c_1\vec{v}_1 + c_2\vec{v}_2 + \dots + c_p\vec{v}_p = 0$ 

not all op's is atleast one cp's is not equal to zero.

 $\langle R \rangle$ : Check linear dependence and independence for  $\vec{V}_1 = \begin{bmatrix} 1 & \vec{V}_2 = 4 & \vec{V}_3 = 2 \\ 2 & 5 & 1 \end{bmatrix}$ 

8010:

To check for dependency;  $c_1 \vec{v_1} = + c_2 \vec{v_2} + c_3 \vec{v_3} = 0$ 

which implies that,  $c_1 + 4c_2 + 2c_3 = 0$  — (i)  $2c_1 + 5c_2 + c_3 = 0$  — (ii)  $3c_1 + 6c_2 + 6c_3 = 0$  — (iii)

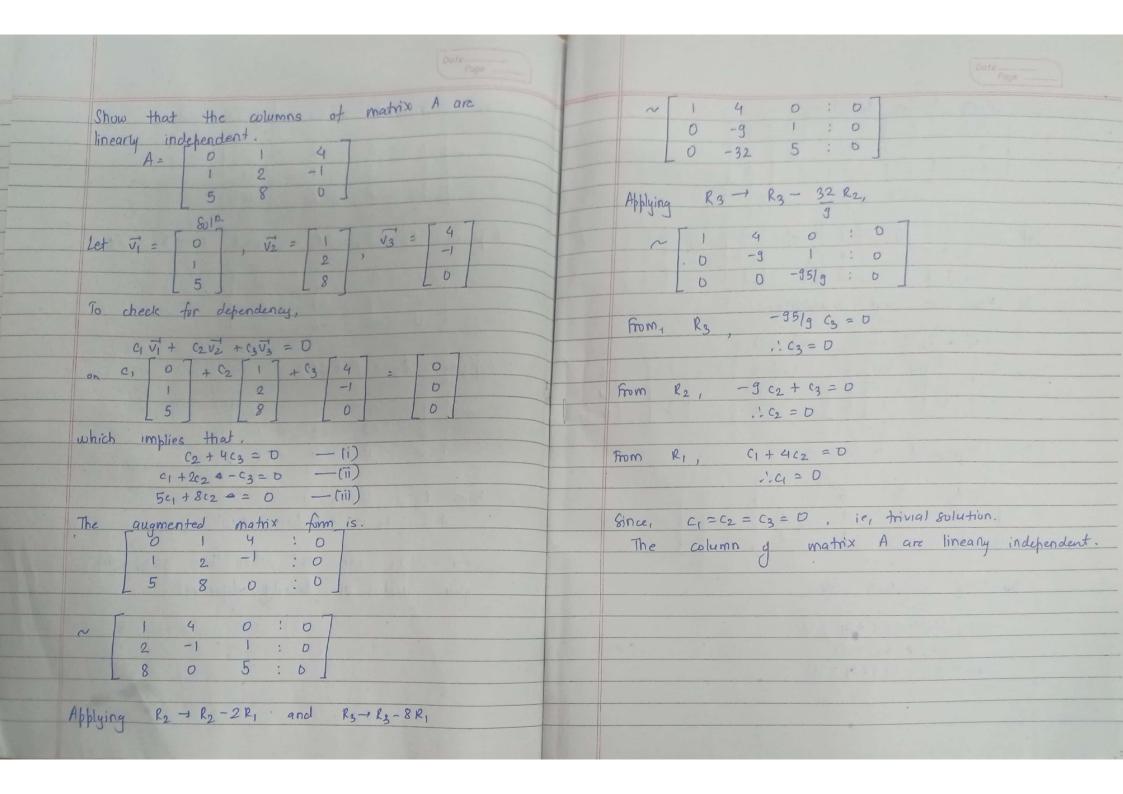
The	augmen	ted	matrix	of given		equations
	1	4	2	!	0	
	2	5	1	:	O	
	3	6	6	:	0	

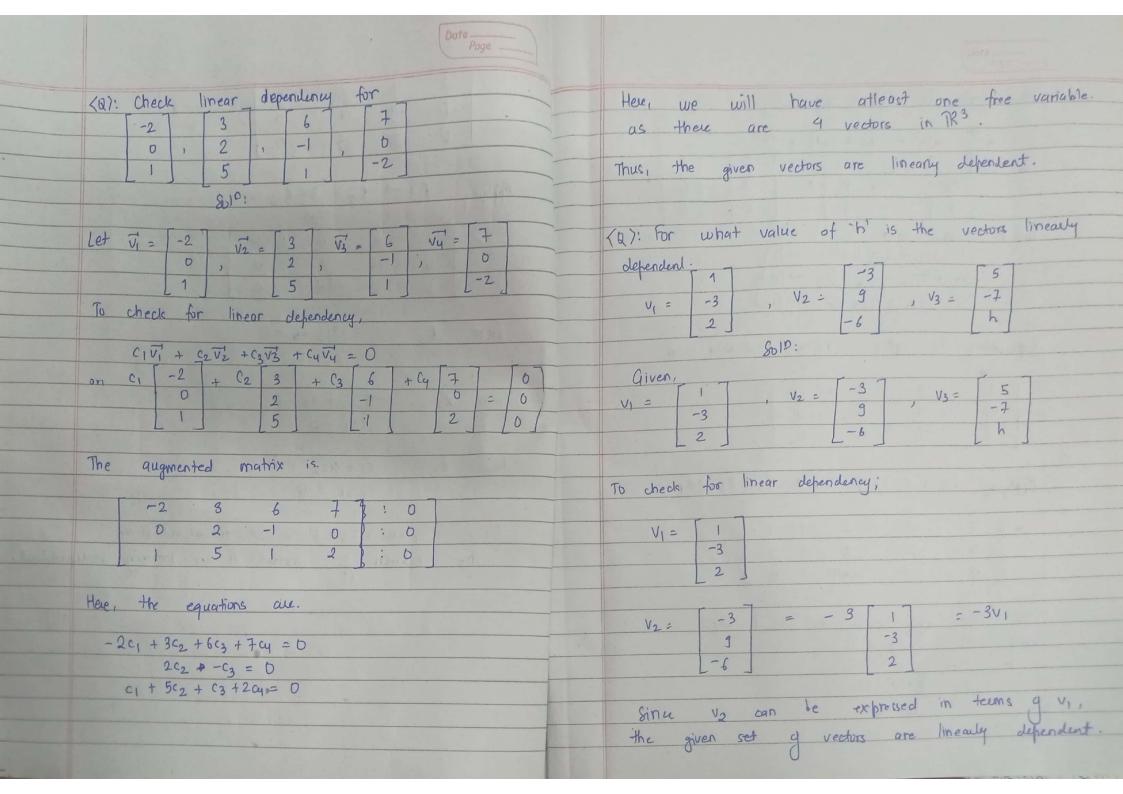
Applying	R2	R2 - 2 R2 - 2 R1			and	R3 → R3 - 3R21
24	1	4	2	1	0	
70	0	-3	-3	2	0	
	0	-6	-6		0	

Applying  $R_3 - R_3 = 2R_2$   $\sim 1 \quad 4 \quad 2 \quad : \quad 0$   $\sim \quad -3 \quad -3 \quad : \quad 0$ 

from R3, 0xc3=0 There, c3 is a free variable.

Since C3 can be other than zew, the given vectors are linearly dependent.





	To check for linear dependency:
-	
	CIHT GV1 + C2 V2 + C3V3 = 0
	or. C. [17 C. [-37 C3 [57 [0]
-	$\frac{6r}{-3}$ $\frac{1}{+}$ $\frac{7}{9}$ $\frac{7}{+}$ $\frac{7}{-2}$
-	2 -6 h LO
4	
	which implies that, $C_1 - 3C_2 + 5c_3 = 0$ — (i) $-3c_1 + 9c_2 - 7c_3 = 0$ — (ii)
1	-3c1 +9c2 -7c3 =0 -(ii)
-	2c1 -6c2 + hc3 = 0 - (iii)
-	
-	Representing the equ's in augmented mostrix form,
-	
-	1 -3 5 : 0
-	-3 9 -7:0
-	2 -6 h: 0 ]
-	
	Applying, R2 -+ R2 + 3R1 and R3 -+ R3 - 2R1
	~ 1 -3 5 : 0
	0 0 8 : 0
	0 12 h-10: 0 J
	En the an wanter to be linearly

for the equ vectors to he linearly independent,  $C_3 \neq 0$ .  $C_3 = h - 10 = 6$ 

: h = 10