## # Null Space:

The null space of Amon is the set of all vectors  $\vec{n}$  such that  $A\vec{n} = \vec{0}$  ie, Null (A) or N(A) =  $\int \vec{n} \in \mathbb{R}^n | A\vec{n} = \vec{0}$ 

(Q1: Find null space of A= [1 1 1 1 1 1 1 2 3 4 4 4 3 2 1

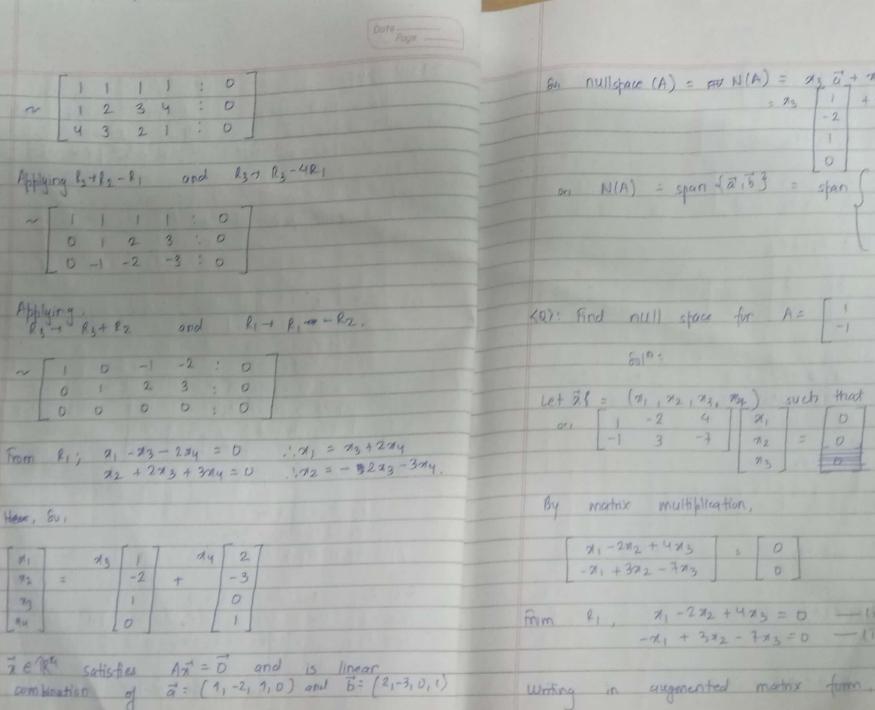
Let  $\vec{a} := \begin{bmatrix} a_1 \\ b_2 \end{bmatrix}$  such that  $A\vec{a} = \vec{b}$ .

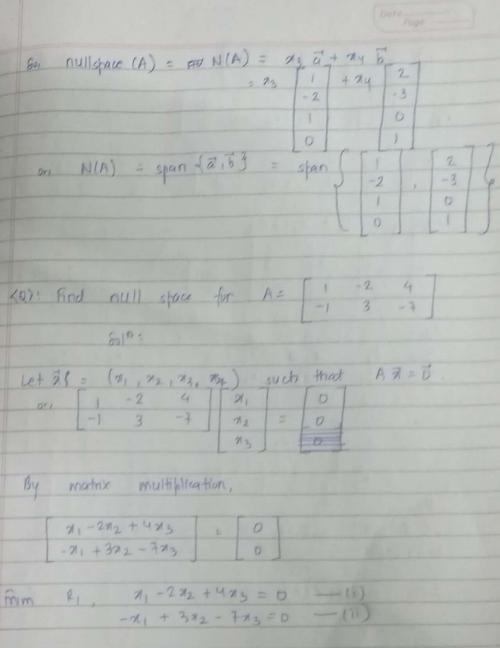
By matrix multiplication,

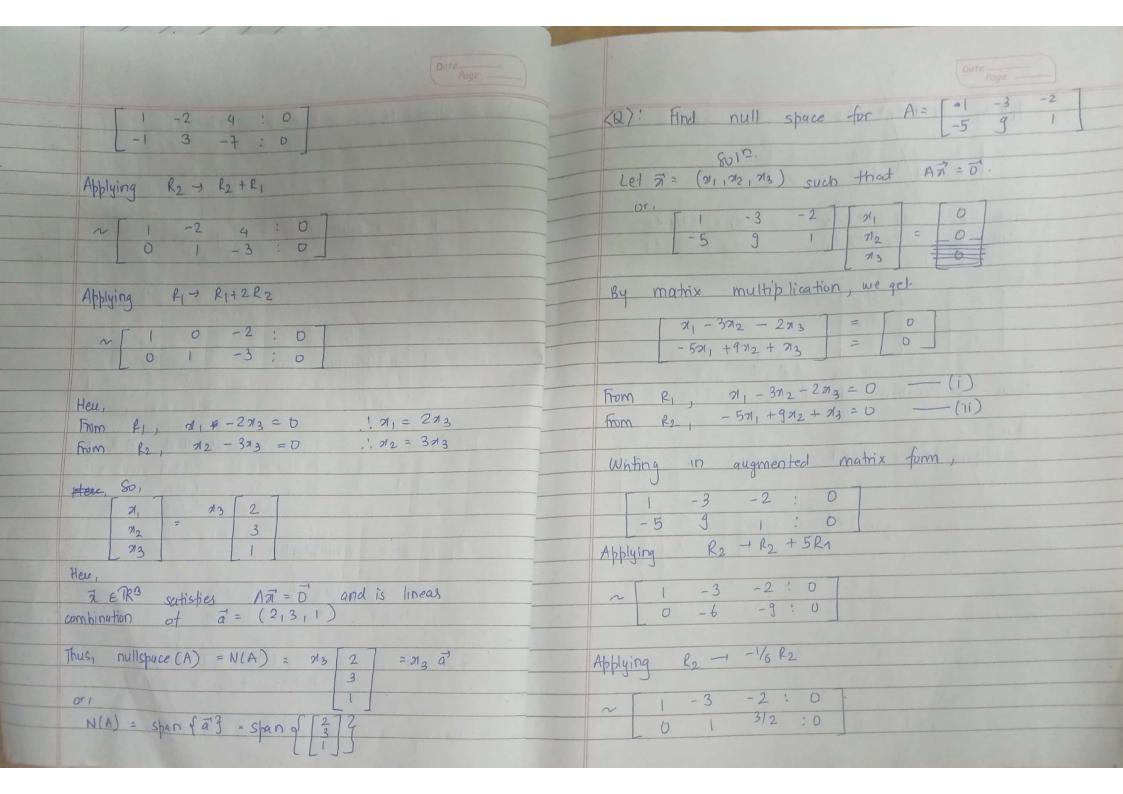
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from R<sub>1</sub>,  $\alpha_1 + 2\alpha_2 + 3\alpha_3 + 4\alpha_4 = 0$  — (i) from R<sub>2</sub>,  $\alpha_1 + 2\alpha_2 + 3\alpha_3 + 4\alpha_4 = 0$  — (ii) from R<sub>3</sub>,  $4\alpha_1 + 3\alpha_2 + 2\alpha_3 + \alpha_4 = 0$  — (iii)

writing in augmented matrix form,







Applying  $R_1 + R_1 + 3R_2$   $\sim \begin{bmatrix} 1 & 0 & 512 & 0 \\ 0 & 1 & 312 & 0 \end{bmatrix}$ 

From R1,  $x_1 + 5h x_3$   $\frac{1}{2} x_1 = -512 x_3$ From R2,  $x_2 + 3h x_3$   $\frac{1}{2} x_2 = -3h x_3$ 

So,  $\begin{bmatrix}
31, & -512 \\
92 & = -312
\end{bmatrix}$   $\begin{bmatrix}
13 & 1
\end{bmatrix}$ 

Here,  $\vec{z} \in \mathbb{R}^3$  satisfies  $A\vec{z} = \vec{0}$  and is linear combination of  $\vec{a} = (-5121 - 312)$ 

Thuc,

Nullspace (A) = N(A) = n3 \( \bar{a} = n3 \) \[ -512 \]

-312

or, span  $\sqrt{a}$  = spand  $\begin{bmatrix} -512 \\ -312 \end{bmatrix}$