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H Basis Vectors:

Let S be the subspace of \mathbb{R}^n .

The set of vectors $S \overrightarrow{u_1}, \overrightarrow{u_2}, \ldots, \overrightarrow{u_n} \overrightarrow{3}$ in S is called hasis of S if.

i) the vectors $\vec{u_1}, \vec{u_2}, \dots, \vec{u_n}$ are linearly independent ii) S should be spanned by $\vec{u_1}, \vec{u_2}, \dots, \vec{u_n}$.

Let $\vec{e_1}$, $\vec{e_2}$,..., $\vec{e_n}$ be the column vectors of identify matrix.

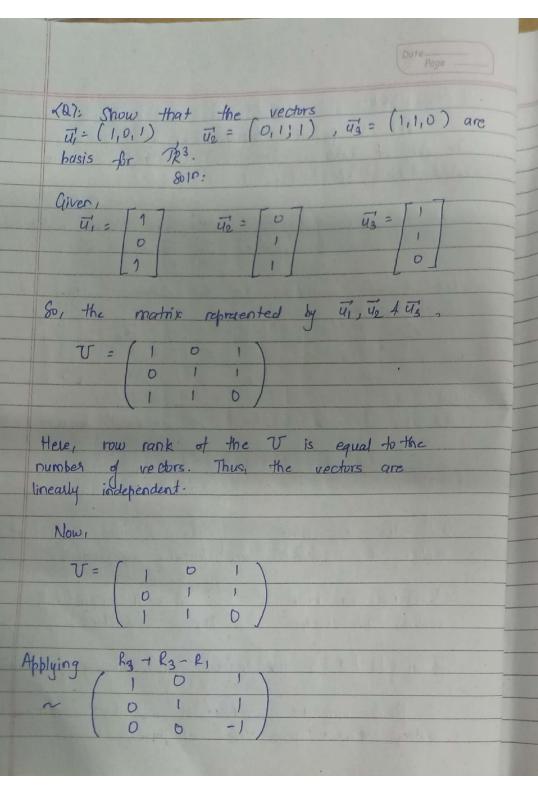
identify matrix. $\vec{e_1} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad \vec{e_2} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad \vec{e_{2n}} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

The set $\{\vec{e}_1, \vec{e}_2, \dots, \vec{e}_n\}$ is standard basis for \mathbb{R}^n .

(X) Notes!

- i) If the row rank is equal to the number of vectors, the vectors are linearly independent.
- vectors, the vectors are linearly dependent.
- iii) if |v| 70, the vectors are linearly independent.

basis can be understood as the minimum set of vectors that span the subspace.



Applying Applying. R32- R2 - R3 R1 -1 R1 - R3 and Since all the pivot elements existe, in RREF,

R3 is a span of $\vec{u_1}$, $\vec{u_2}$ & $\vec{u_3}$ Since the vectors are linearly independent and span 183, 41, 42, 43 are hasis for TR3. (a): Show that $\vec{u}_1 = (3_10, -6)$, $\vec{u}_2 = (-4_11, 7)$ and $\vec{u}_3 = (-2, 1; 5)$ are hasis for TR^3 . Giver, So, the matrix represented by 41, 42 4 43

Here, now rank of I is equal to the number of vectors. Thus, the vectors are linearly independent.

Now,

Applying and,

=3(5-7)+4(0+6)-2(0+6)= -6+24-12 = 6 \$D.

Since |v| ≠0, $\vec{u_1}$, $\vec{u_2}$, $\vec{u_3}$ spans \mathbb{R}^3 .

Hence, \vec{u}_1 , \vec{v}_2 4 \vec{v}_3 are busts for \mathbb{R}^3 .

(a): Find basis for given subspace of \mathbb{R}^3 that the plane with $3\alpha - 2y + 53 = 0$.

Given, $3\pi - 2y + 53 = 0$

Here, y and z are free variables, Putting y=s and z=t, x=2s-5t.

Writing in vector form.

Let "= (11412)

U =	[ol	7 .	5	2/3	t	-513	
	4	1		11	+	0	
	2			[0]		L1]	

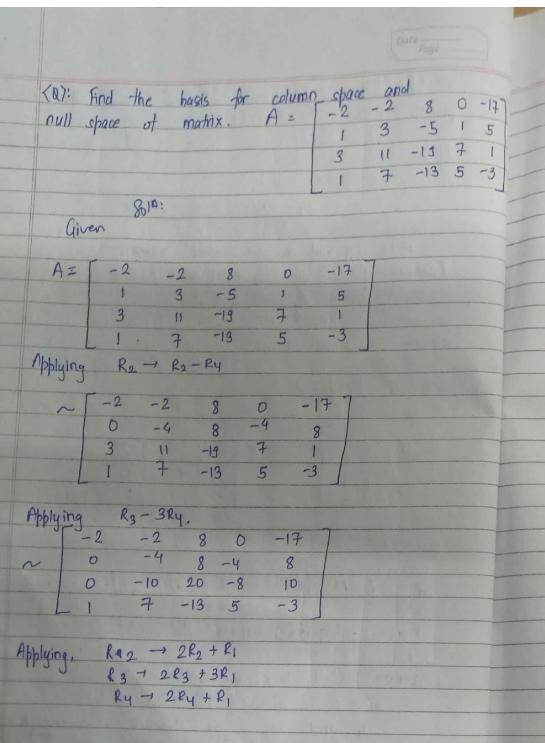
where $\vec{u}_1 = (213, 10)$ and $\vec{u}_2 = (-513, 0, 1)$

Thus Sui, 42 3 spans TR3.

Putting s=t=0, we get.

ū=0., ū=0, ū=0

Thus fund 42 are linearly independent.
Thus fundz Uld. 42 are hours for TR3.



	-2	-2	8	0	-17
n	0	1	-2	2	-7
	0	7	-14	14	-49
	0	9	-18	10	-23

Applying R3 - 7R2

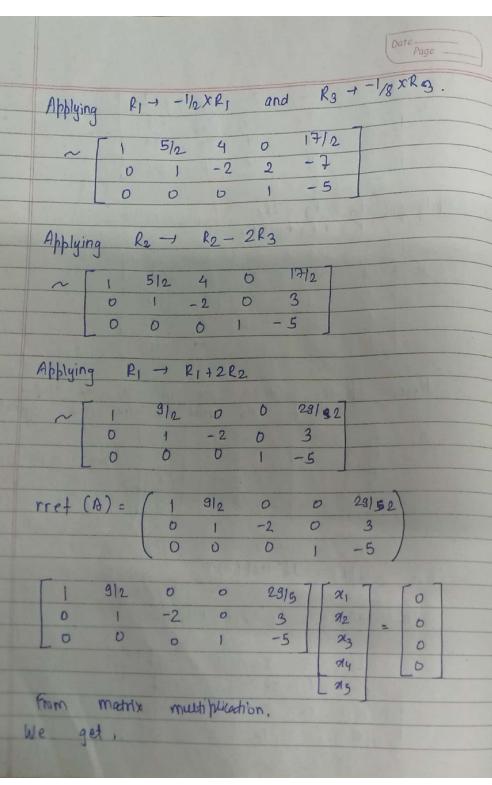
R4 - 1R4 = 9R2

~	T-2	- 5	8	0	-17	1
	0	1	-2	2	-7	
	0	0	0	D	0	
	0	0	0	-8	40	

Here,	pivot Hene	positi	ms ms	are	in ng	one free variables.
80, 8	T-2		[-2	7	0	
	1	1	3	1	1	are hasts of col(A).
-	3		11		7	U
11.81	1		7	1	5	

Now N(A) = N(rref(A)).

Interchanging R3 and R4,



24 - 595 = 0x2 - 73 +35x5 = 0 x1 - 9/2 x2 + 29/5 75 = D Here my and my are free variables. let my=5, ds=t. 80, dy = 525 : 24 = 5t 22 = 23 - 325 1. 2 = S - 3t 2 9 x5 $1: \alpha_1 = -9s - t$ Writing in vector form. 5 dy 25 N(A)= N(ret(A)) = 13 a + 15 b where, $\vec{a} = (-9, 1, 1, 0, 0)$ and $\vec{b} = (-1, -3, 0, 5, 1)$ =span {a,b} = span Here, a and b Hence, of Hence, of and of L