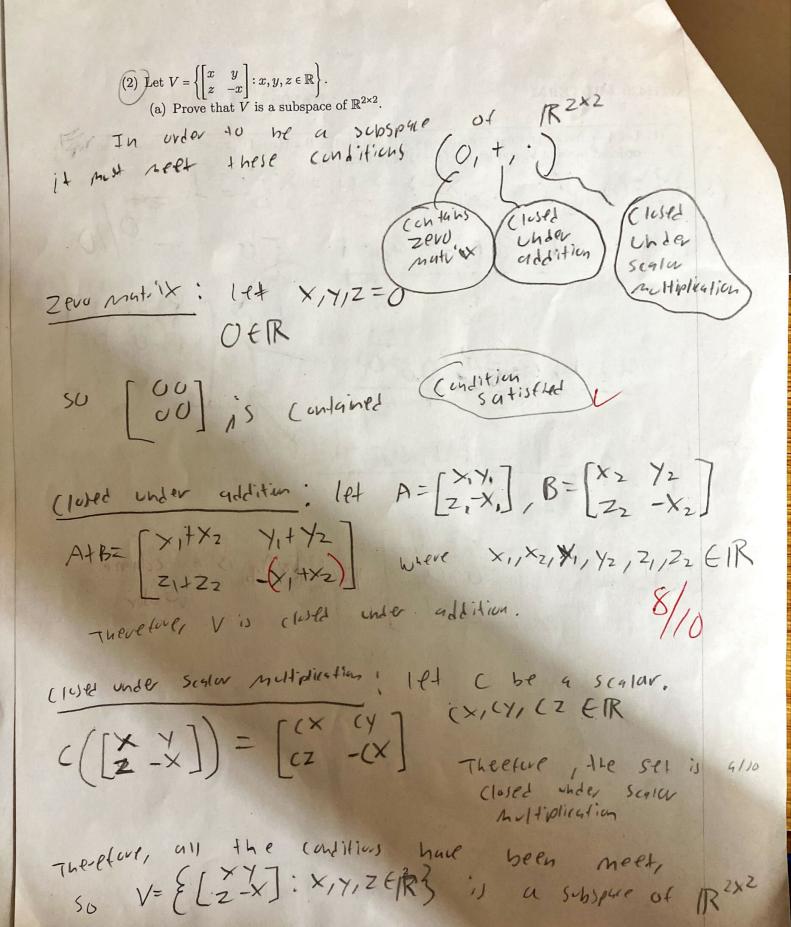
(1) Let $V = \{a_0 + a_1x + a_2x^2 : a_0, a_1, a_2 \in \mathbb{R}\} \leq \mathbb{R}[x]$. Let $\mathcal{B} = ((x-1)^2, x^2, x^2 - 1)$, which is an ordered basis of V, and let $\alpha = (x-1)^2 \in V$. Find $[\alpha]_{\mathcal{B}}$.

92=1,91=-2,90=1

92=1,9,=0,90=0

, 9,=0, 40=-1

[2]3 = [4 00] Worn [x)B 15 a column we ctor.



command

(b) Let
$$B = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}, \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix},$$
 which is an ordered basis for V , and define

$$T\begin{pmatrix} x & y & z \\ y & z \end{pmatrix} = \begin{bmatrix} a & b & x & y \\ c & d & z & -x \end{bmatrix}, \begin{bmatrix} x & y & a & b \\ z & -x & z \end{bmatrix}, \begin{bmatrix} a & b & b \\ z & -x & z \end{bmatrix}$$
Compute $M_{B,B}(T)$.

$$T\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & -1 \\ 2 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & -1 \\ 2 & 2 \end{bmatrix}$$

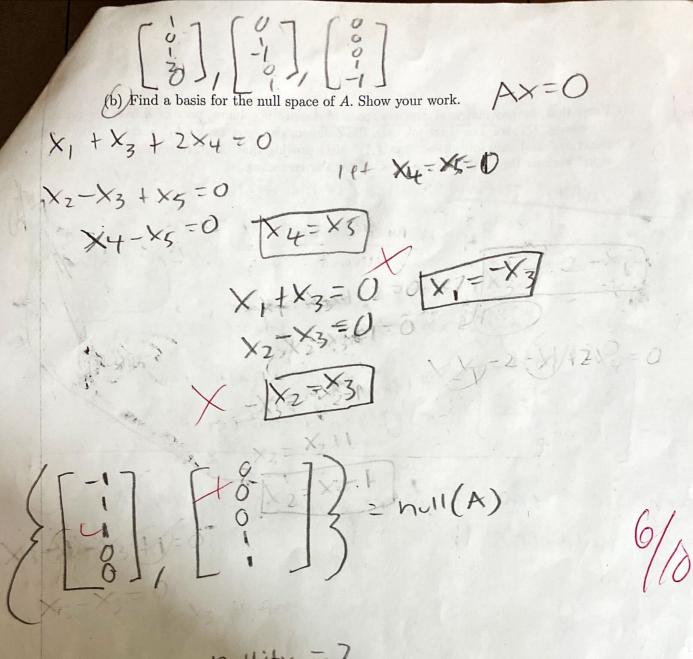
$$\begin{bmatrix} a & b \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & b \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} 0 & -2b \\ 2c & 0 \end{bmatrix}$$

$$T\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & b \\ 0 & -1 \end{bmatrix}, \begin{bmatrix} 0 & b \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & -2b \\ 0 & 0 \end{bmatrix}$$

$$T\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

 $A = \begin{bmatrix} 1 & 1 & 0 & 1 & 2 \\ 0 & 1 & -1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 2 & 0 \end{bmatrix}$ (a) Find a basis for the row space of A. Show your work. R3-R1 [0 1 -101] R3+R2 [1 10 12]
R4-R1 [0 -1 1 0-1] R4+R2 [0 0 0 0 0]
[0 -1 1 1 -2] R4+R2 [0 0 0 0 0] row sphu consists
of rows not columns rank(A)=3

Aboute Ola



nulity = 2

(4) Prove that, for any matrix A, the row space of A and the column space of A have the same dimension. (Note: The textbook calls these dimensions "row rank (A)" and the "column rank (A)" and only introduces "rank (A)" after proving that they are equal. So "they are equal because they are both the rank" is circular reasoning.)

Find the rank of the ran