

Assignment 4

Linear Algebra (National University of Computer and Emerging Sciences)

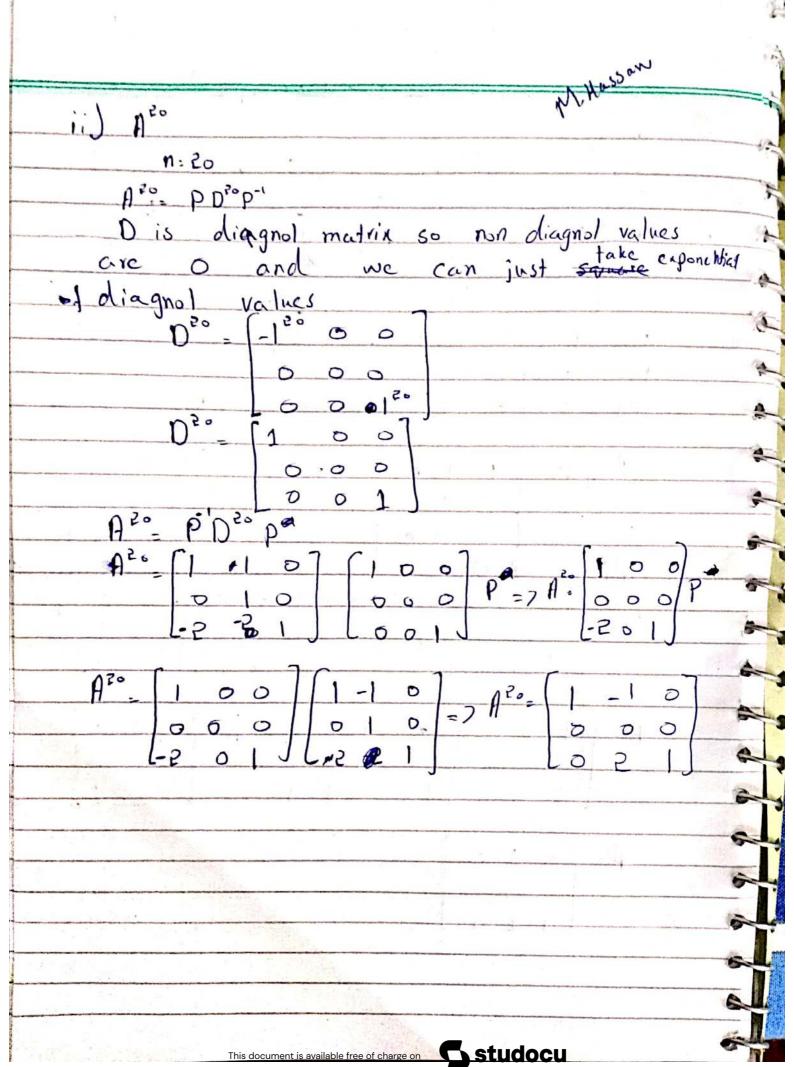
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Roll no: 18I-0564 Course:- Linear Algebra
Course:- Linear Figeria
Submitted to: Sir Irfan Shah
Submittee 10: 5:1 Gift

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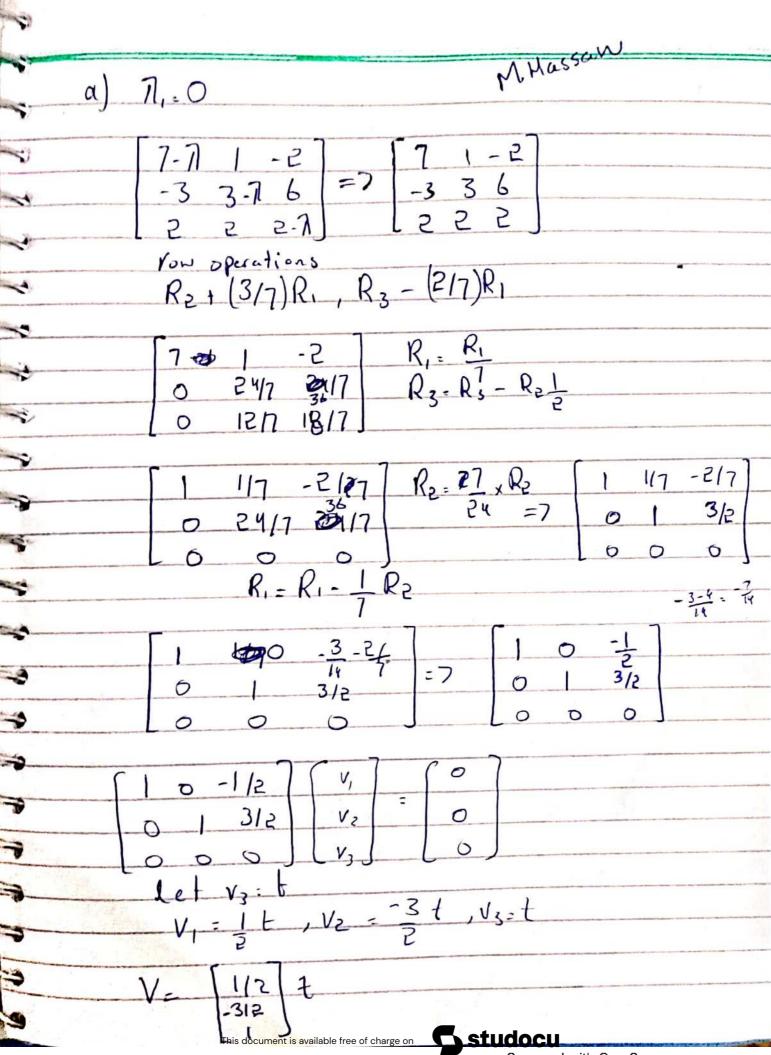
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M. Hassan Question 1 Vz=(-1,1,0), vs=(0,0,1) N 1(1-0)-(-1)(0-0)+0(0-2) 1 1P1: 1 # 0 so eigenvectors are L. Adj P= -5 01 -3 A. 73 =7 0 -=7 A. 3 0-0 3



M. Hassan Question 2, det (A-NI).0 7-7 1 -2 -3 3-11 6 2 2 2-11 7-7 ((3-7)(2-7)-12)-1(-3(2-7)-12)-2(-6-2(3-7)) 7-71 (6-57+12-12)-1(-6+37-12)-2(-6-6+27)=0 (7-17) (72-57-6)+6-37+12+12+12-471=0 772-357-42 +73+572+67+12+240-77=0 -73+772+572-35A+67-77 -42+42 -73+1272-367=0 71 (- 127 - 36) =0 7 (-72+67+67-36):0 7 (71-7+6) \$6(-7+6)).0 7 (-7+6)(7-6)=0 1=0, 7=6, 7=6

7



Massan

$$\begin{bmatrix}
 7-7 & 1 & -2 \\
 -3 & 3-7 & 6 \\
 2 & 2 & 2-7
 \end{bmatrix}
 =
 \begin{bmatrix}
 1 & 1 & -2 \\
 -3 & -3 & 6 \\
 2 & 2 & -4
 \end{bmatrix}
 =
 \begin{bmatrix}
 R_2 + 3R_1, R_3 - 2R_1
 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

Let
$$v_{z} \leq s$$
, $v_{z} = t$

$$\begin{array}{c|c}
v_{1} & 2 & t - S \\
\hline
v_{2} & 1 & 1 \\
\hline
s & 1 & 1
\end{array}$$

Eigenvectors

$$P_{1}: (1/2, -3/2, 1), P_{2}: (2, 0, 1),$$

adj
$$P = \begin{bmatrix} -1 & 1 & -3/2 \\ -1 & 1 & 3/2 \end{bmatrix}$$
, $\begin{bmatrix} -1 & -1 & 2 \\ 1 & 1 & 1 \\ 2 & 1 & 3 \end{bmatrix}$

$$\frac{1}{2}$$
 $\frac{2}{2}$ $\frac{2}$

Wyasam
a) HI TO UI Let B. HIBI
Same as 1813.
So 7, : 3, 72.9, 72.9
$\beta : P D P''$ $\beta : P (D \cdot 3I) P''$
B. P[84 2 0] P-1
71.=40, 71= 60, 713= 010
B) As The of A is O so the
have eigen values.
then A will have 1/7 and 11 and 10 doesn't exist.

Question 3. Eigen vectors = C1-C2 = This document is available free of charge on C1= 14C5

M. Hassaw

5: C, 1C2 5: C, 1C2 2C2: B C2: 3 C1: 11C2

C1: 4, C2: 3

Question 4:

M. Hassan

$$X = A X$$

 $X' = \begin{bmatrix} 7 & 1 & -2 \\ -3 & -3 & 6 \\ 2 & 2 & 2 \end{bmatrix} \begin{bmatrix} x & y \\ y & z \end{bmatrix}$

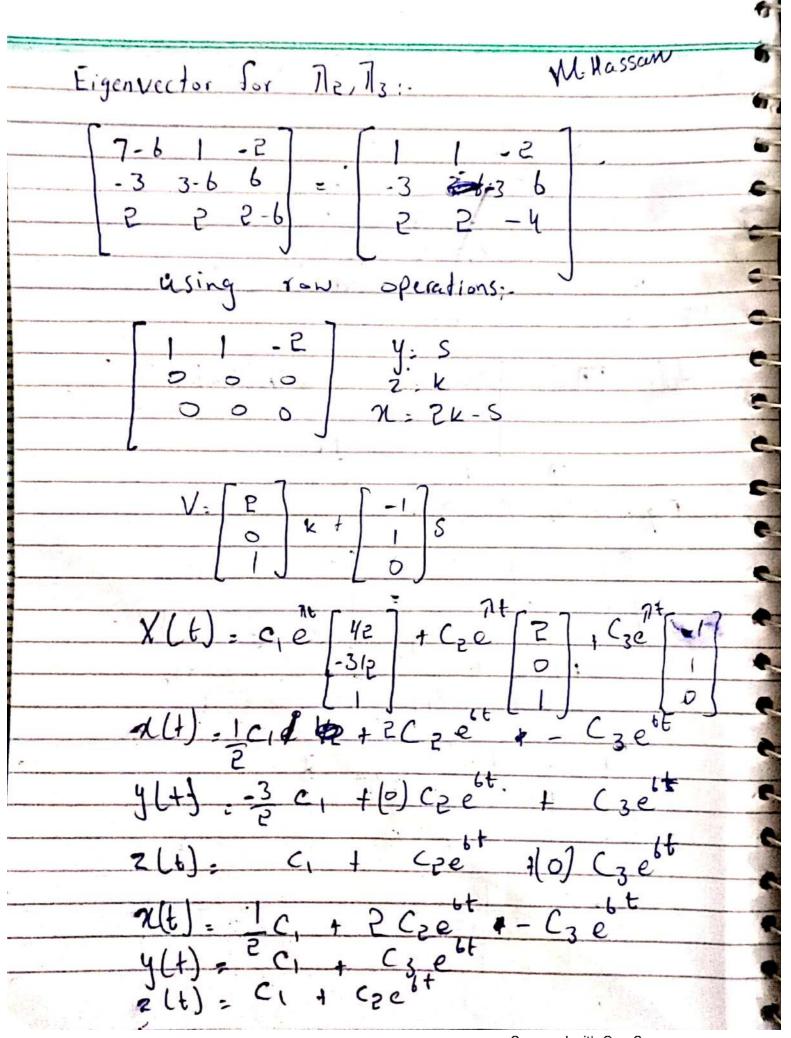
solved this exmetrinatrix in Question be picking data from there.

7-7 1 -2 = 7(-7:6)(7-6) -3 3-71 6

7,0, 72 = 6, 73 = 6

i) Eigenvector for

After doing row operations reduce this matrix to



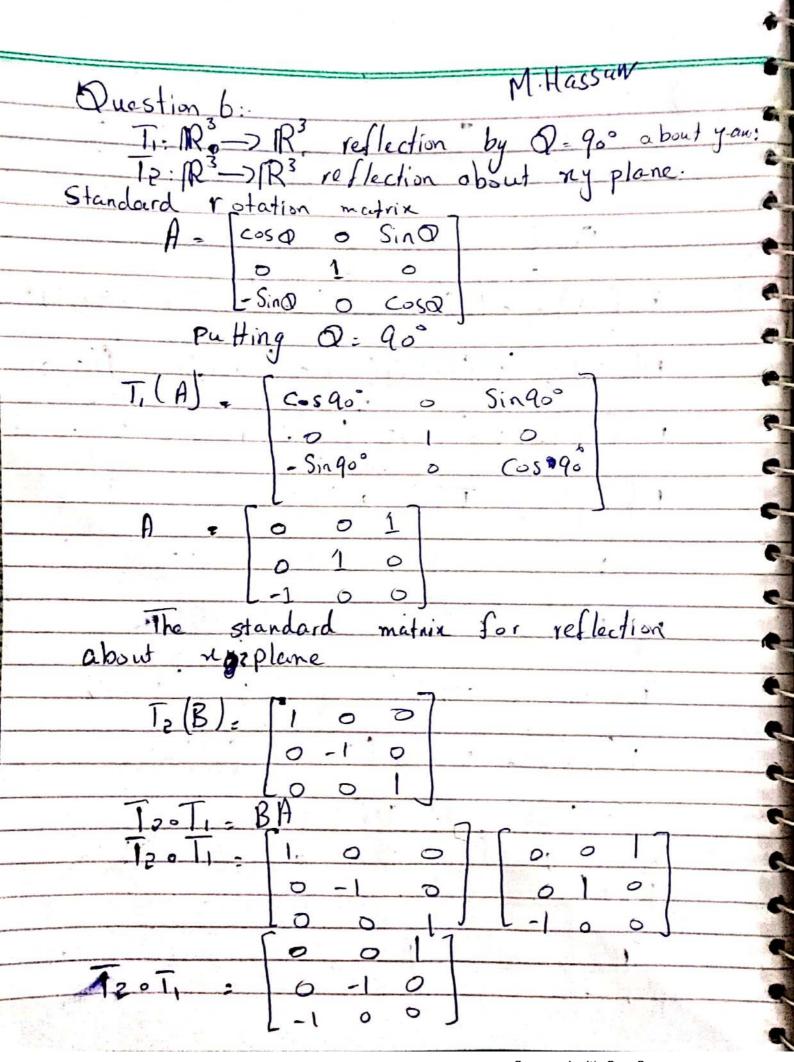
M.Hassan Question 5: T: $V \rightarrow V$ $T(f): 5 f(x) + 3 \int_{a}^{x} f(t) dt$ Prove T is linear operator:-T(f,g) = 5(f(n)+g(n)) + 3(f(n)+g(n))dtT(f,g) = 5 f(u)+5g(n)+3 f(x)d+ 13(f(x)dt T(S,g)= 55(n)+3Js(n)at +5g(n)+3 fg(n)dt T(f,g) = T(f) + T(g) Hence first condition satisfies

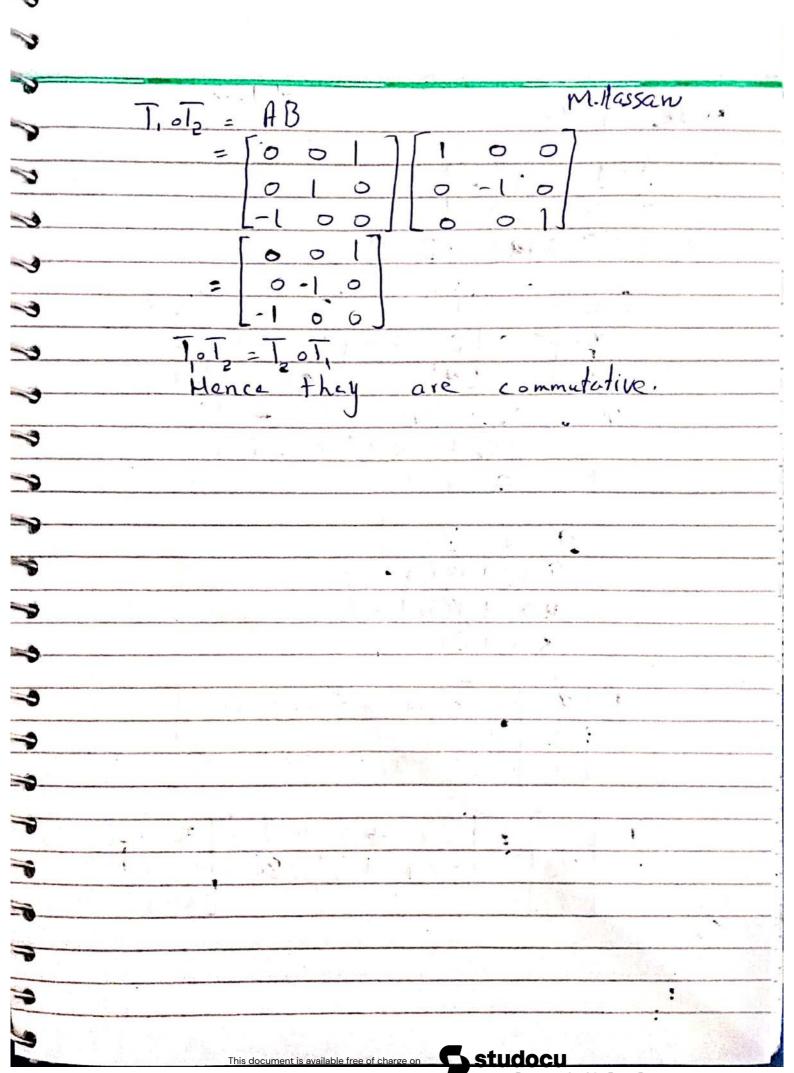
let k be any scalar

T[kf] = 5 (k flu) + 3 [k flu]dt T(kf): 50kk(5.flu)) + k3 j k stildt $T(kf) = k \left(s f(n) + 3 \left(f(t) dt \right) \right)$ T[kf]: k T(f)

Hence This conditions holds

true as well. There fore I is a linear operator.





Question 7.

MHassan

$$T(1,2,1).(1,5)$$

 $T(2,9,0).(-1,1)$
 $T(3,3,49).(2,4)$

$$\begin{bmatrix}
 x_1 \\
 x_2 \\
 x_3
 \end{bmatrix} = a \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix} + b \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + C \begin{bmatrix} 3 \\ 3 \\ 4 \end{bmatrix} \\
 x_1 = a \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + C \begin{bmatrix} 3 \\ 3 \\ 4 \end{bmatrix}$$

$$\begin{cases}
 x_1 \\
 x_2 \\
 x_3
 \end{bmatrix} = a \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + b \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + C \begin{bmatrix} 3 \\ 3 \\ 4 \end{bmatrix}$$

$$\begin{cases}
 x_1 \\
 x_2 \\
 x_3
 \end{bmatrix} = a \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + b \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + C \begin{bmatrix} 3 \\ 3 \\ 4 \end{bmatrix}$$

$$\begin{cases}
 x_1 \\
 x_2 \\
 x_3
 \end{bmatrix} = a \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + b \begin{bmatrix} 2 \\ 4 \\ 3 \end{bmatrix} + C \begin{bmatrix} 3 \\ 3 \\ 4 \end{bmatrix}$$

x2 = 2a + 9b + 3c - (ii) x3 = a + 4c

$$T \begin{bmatrix} \chi_1 \\ \chi_2 \end{bmatrix} : \begin{bmatrix} -23\mu_1 + 5\mu_2 + 14\mu_3 \\ -134\chi_1 + 31\chi_2 + 82\chi_3 \end{bmatrix}$$

Verifying T(v,), T(vz)	M. Hassan
T(1,2,1): [-23 5 14] [1 [-139 31 82] 2	$\left\{\begin{array}{c} 1 \\ 5 \end{array}\right\}$
T(2,9,0)=[.23 5 14] [-134 31 82]	$\begin{bmatrix} 2 \\ 9 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$