PRACTICE SHEET # 1

Exercise – 1.3

1. Solve the following matrix equation for and .

= 

2. Consider the matrices:

A =  , B = , C =  ,

D =  , E =  ,

3. using the matrices in exercise (3) , compute the following (where possible) .

1. AB , (b) BA , (c) (3E) D , (d) (AB )C , (e) A (BC) , (f) CCT ,

(g) (DA)T , (h) (CT B) AT , (i) tr (DDT) , (j) tr (4ET – D),

(k) Tr(CT AT + 2ET) .

4. using the matrices in exercise (3) , compute the following (where possible) :

(a) (2DT – E ) A , (d) ( B AT – 2C )T .

Exercise-2.4

1. Let A =  ,

(a) Find all the minors of A

(b) Find all the cofactors , (c) Find adj (A) ,

(d) Find A-1 , using A-1 =  adj (A) .

2. Find the inverse of the following matrices

|  |  |  |  |
| --- | --- | --- | --- |
| (a) |  | (b) |  |
| (c) | Let B =  and C =  then prove that (BC)-1 = C-1 B-1 | (d) |  |

**3.** Find the inverse of the following matrices if it exists, using [**A: I]:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| (a) |  | (b) |  | (c) |  |
| (d) |  | (e) |  | (f) |  |
| (g) |  | (h) |  | (i) |  |

**4.** If  &  , prove that 

PRACTICE SHEET # 2

**1.** Determine the values of parameters  & , such that the following system has

(i) no solution (ii) a unique solution (iii) more than one solution :

 .

**2.** Determine the values of parameter (s) such that the following system has

(i) no solution (ii) a unique solution (iii) more than one solution :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| (a) |  | (b) |  | (c) | *x + y + kz = 2*  *3x + 4y + 2z = k*  *2x + 3y –z = 1* |
| (d) |  | (e) |  |  |  |

**3.** Solve each of the following systems by Gaussian elimination or Gauss – Jordan elimination:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| (a) |  | (b) |  | (c) |  |
| (d) |  | (e) |  |  |  |

4. Solve, using x = A-1 b

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| (a) |  | (b) |  | (c) |  |
| (d) |  | (e) |  | (f) |  |
| (g) |  | (h) |  |  |  |

**PRACTICE SHEET # 3**

**Q1.** Determine whether each of the following sets are linearly independent / dependent:

(i){(2 ,1 ,2) , (0 , 1 , - 1) , (4 , 3 , 3)} .

(ii) {(3 , 0 , 1 , -1) , (2 , -1, 0 , 1) , (1 , 1 , 1 , -2)} .

(iii) {(1 , - 4 , 2) , (3 , - 5 , 1) , (2 , 7 , 8) , (- 1 ,1 , 1)} .

(iv) {(0 , 1 , 0 , 1) , (1 , 2 , 3 , -1) , (8 , 4 , 3 , 2) , (0 , 3 , 2 , 0)} .

(v) {(1 , 3 , 2) , (1 , -7 , - 8) , (2 , 1 , - 1)} .

(vi) {(3 , 0 , 4 , 1) , (6 , 2 , -1 , 2) , (-1 , 3 , 5 , 1) , (- 3 , 7 , 8 , 3)}

(vii) {(4 , -4 , 8 , 0) , (2 , 2 , 4 , 0) , (6 , 0 , 0 , 2) , (6 , 3 , -3 , 0)} .

**Q2.** Prove that the following vectors form a basis for  /  :

(i) (1 , 2 , 0) , (0 , 5 , 7) & (-1 , 1 , 3) . (ii) {(2 , 0 , 1) , (1 , 1 , 1)} .

(iii) {(1 , 1 , 1 , 1), (0 , 1 , 1 , 1) , (0 , 0 , 1 , 1) , (0 , 0 , 0 , 1)} .

**Q3.** Find the dimension of the subspace generated by the set

{(1 , 2 , 1) , (3 , 1 , 2) , (1 , -3 , 4)} of  .

**Q4.** Let U be the subspace of  spanned (generated) by the vectors

(1 , 2 , 1) , (0 , - 1 , 0) & (2 , 0 , 2) , find a basis and dimension of  **U .**

**Q5.** Let W be the subspace of generated by the vectors

(1 ,- 2 , 5 ,-3) , (2 , 3 , 1 , - 4) & (3 , 8 , - 3 , - 5) , find a basis and dimension of **W**.

**Q6.** Find the rank of the following matrices:

(**i)**  **(ii)**  **(iii**)  .

**(iv)**  (**v**).

**Q7.** Find the rank and nullity of the following matrices:

**(**i)(**ii**)(**iii**)

(**iv**)

**Q8.** Which of the following define linear transformation from **** to ****:

(i) (ii) 

(iii) .

**Q9.** Let  be the linear transformation defined by

,

find a basis & dimension of range space of (T) & null space of (T) .

**Q10.** Let  be the linear transformation defined by

 ,

find a basis & dimension of (i) Range(T) & (ii) Ker (T) .

**Q11.** Let  be the linear transformation defined by

,

find a basis & dimension of (i) Range(T) & (ii) Ker (T) .

**Q12.**  Let  be the linear transformation defined by

 ,

find a basis & dimension of (i) Range (T) & (ii) Ker (T) .

**Q13.** Find all eigenvalues and the corresponding eigenvectors of the following

matrices:

(**i)**  (**ii**)  (**ii**i) 

**Q14.** Find a matrix P that diagonalizes the following matrices, also find  :

**(i)**  **(ii**)  (**iii)** 

**Solve the following problems given in the book "Elementary linear algebra by Howard Anton and Chris Rorres, Application version, eigth edition."**

\_ Ex 5.5: 3(a,b), 6(a,b), 7(a,b),8(a, b,c), 11(a,c),12(a,b)

\_ Ex 5.6: 1, 2(a,b,c)

\_ Ex 8.1: 13, 16

\_ Ex 8.2: 3,4, 10, 11

\_ Ex 7.1: Consider the matrix given in 4(a,c,d). Find the eigenvalues and their corresponding

eigenvectors that form bases for eigenspace. If possible, diagonalize those matrices.