Mathematics Assignment - 04
Vector Spaces and Subspaces

Solve all the questions August 25, 2018

Question 01

Find the rank of the following matrices

$$A = \begin{bmatrix} 5 & -2 & 5 \\ 11 & 4 & -8 \\ 5 & 9 & 8 \\ 1 & 11 & 23 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 5 & 4 & 6 \\ 8 & 5 & 6 & 9 \\ 4 & 5 & 6 & 8 \end{bmatrix} \tag{1}$$

Question 02

Use Rank-Nullity theorem to compute the rank of following matrix

$$A = \begin{bmatrix} 1 & 1 & 2 & 3 \\ 3 & 4 & -1 & 2 \\ -1 & -2 & 5 & 4 \end{bmatrix} \tag{2}$$

Question 03

Find the basis for Row Space as well as Column Space for:

$$A = \begin{bmatrix} 5 & 6 & 5/4 \\ 7 & 7 & 7/3 \\ 1 & 3 & 8 \end{bmatrix} \tag{3}$$

Question 04

Find the basis of Null Space of A as well as A^T for

$$A = \begin{bmatrix} 8 & 7 & 4 & 2 \\ 3 & 8 & 2 & 2 \\ 8 & 7 & 8 & 2 \end{bmatrix} \tag{4}$$

Question 05

Determine the existence and uniqueness of solutions of the system:

$$3x_2 - 6x_3 + 6x_4 + 4x_5 = -5$$
$$3x_1 - 7x_2 + 8x_3 - 5x_4 + 8x_5 = 9$$
$$3x_1 - 9x_2 + 12x_3 - 9x_4 + 6x_5 = 15$$

Question 06

Find the basis of the row space for

$$A = \begin{bmatrix} 4 & 5 & 6 \\ 2 & -5 & 6 \\ 8 & 10 & 12 \end{bmatrix} \tag{5}$$

Question 07

Suppose a 3×5 coefficient matrix for a system has three pivot columns. Is the system consistent? Why or why not?

Question 08

Let $A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 10 \\ 3 \\ 3 \end{bmatrix}$ and let W be the set of all linear combinations of columns of A.

- Is b in W?
- Show that the third column of A is in W.

Question 09

Find solution of Ax=B for the following non-homogeneous system :

$$A = \begin{bmatrix} 3 & 5 & -4 \\ -3 & -2 & 4 \\ 6 & 1 & -8 \end{bmatrix} \quad B = \begin{bmatrix} 7 \\ -1 \\ -4 \end{bmatrix} \tag{6}$$