Assignment 1 Questions

CS 556

1

Solve the system of equations using elimination and backwards substitution :

$$
\begin{aligned}
2x + 3y + z &= 8 \\
4x + 7y + 5z &= 20 \\
-2y + 2z &= 0
\end{aligned}
$$

2

Find the rank of the following matrix:

$$
\begin{bmatrix}
0 & 1 & 2 & 1 \\
1 & 2 & 3 & 2 \\
3 & 1 & 1 & 3
\end{bmatrix}
$$

3

Construct a matrix A whose column space contains vectors $\begin{bmatrix} 3 \\ 6 \\ 2 \end{bmatrix}$ and $\begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix}$, and

whose null space contains the vector $\begin{bmatrix} 2 \\ 2 \\ 1 \end{bmatrix}$

4

Find the distance from the vector $\vec{b} = \begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}$ to the plane spanned by $\vec{v_1} = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$,

and $\vec{v_2} = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$

5

Compute the following matrix-vector multiplication as:

    a. Linear combination of columns.

    b. Dot product of rows.

$$\begin{bmatrix} 2 & 1 & 3 \\ 7 & 1 & 0 \\ 3 & 5 & 9 \end{bmatrix} \begin{bmatrix} 2 \\ 4 \\ 1 \end{bmatrix}$$

6

Find the value of k for which the matrix has:-

    a. Dependent columns.

    b. Independent columns.

$$\begin{bmatrix} 1 & 3 & 2 \\ 2 & 3 & 1 \\ 4 & 8 & k \end{bmatrix}$$

7

Use Gram-Schmidt process to find an orthogonal basis for the subspace spanned
by $\vec{a} = \begin{bmatrix} 1 \\ 0 \\ 3 \end{bmatrix}$, $\vec{b} = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $\vec{c} = \begin{bmatrix} 1 \\ 1 \\ 3 \end{bmatrix}$