

Math 002B Assignment 1.4

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1. Compute the following combination vector using
  - a. Ordinary Matrix Multiplication
  - b. Using Linear Combinations of Columns of A.
  - c. Using Combinations of Rows of b.

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

2. Write the Matrix equation as a vector equation.

$$\begin{bmatrix} 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & -1 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$$

3. Write the given system of equations as

$$\begin{cases} x_1 - x_2 + x_3 - x_4 = 0 \\ x_1 + x_2 + x_3 - x_4 = 0 \\ x_1 - x_2 + x_3 + x_4 = 0 \end{cases}$$

- a. Matrix equation
- b. Vector equation

4. Let  $W = \{(1,1,1), (1,-1,2), (1,0,1)\}$ , Express the vector  $b$  in terms of vectors in  $W$ .  
 $b = (2,1,1)$

5. Let  $W = \{(1,1,1), (1,-1,2), (0,2,-1)\}$  Is the vector  $b$  given below in the Linear span of the set  $W$ . Prove your answer.  
 $b = (2,3,1)$

6. Let  $\mathbf{A} = \begin{bmatrix} 3 & -5 \\ -2 & 6 \\ 1 & 1 \end{bmatrix}$ ,  $\mathbf{u} = \begin{bmatrix} 0 \\ 4 \\ 4 \end{bmatrix}$

Is  $\mathbf{u}$  in the plane spanned by the columns of  $A$ , namely  $CL(A)$ ?

7. Let  $\begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 0 \\ 1 & 5 & 2 \end{bmatrix}$

Find a vector in  $\mathbb{R}^3$  orthogonal to vectors represented by the rows of the matrix  $A$ .