MATH2210Q - Quiz #1 Name: Soln 5pts total

For full credit, you must show all work and circle your final answer.

$\boxed{1}$ (a) Find the solution set to the following matrix equation. (Write it in parametric form.)

$$\begin{bmatrix} 3 & -5 \\ -2 & 6 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 8 \\ 8 \end{bmatrix}$$

$$\left[\begin{array}{cc:c} 3 & -5 & 0 \\ -2 & 6 & 8 \\ 1 & 1 & 8 \end{array}\right] \sim \left[\begin{array}{cc:c} 1 & 1 & 8 \\ 3 & -5 & 0 \\ -2 & 6 & 8 \end{array}\right] \sim \left[\begin{array}{cc:c} 1 & 1 & 8 \\ 0 & -8 & -24 \\ 0 & 8 & 24 \end{array}\right] \sim \left[\begin{array}{cc:c} 1 & 1 & 8 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{array}\right] \sim \left[\begin{array}{cc:c} 1 & 0 & 5 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{array}\right]$$

$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$ is the only solution

(b) Find the solution set to the following vector equation. (Hint: Compare to the above.)

$$x_1 \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix} + x_2 \begin{bmatrix} -5 \\ 6 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 8 \\ 8 \end{bmatrix}$$

This vector equation is equivalent to the matrix equation above.

$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$ is the only solution.

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2 Determine which of the following sets of vectors are linearly independent.

(a) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 5 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 9 \\ 0 \\ -1 \end{bmatrix} \right\}$

linearly independent

$\begin{bmatrix} 1 \\ 2 \\ 5 \\ 2 \end{bmatrix} \neq c \begin{bmatrix} 2 \\ 9 \\ 0 \\ -1 \end{bmatrix}$ for any c in $\mathbb{R}$.

(b) $\left\{ \begin{bmatrix} 2 \\ -2 \\ 3 \\ 9 \end{bmatrix}, \begin{bmatrix} 7 \\ 9 \\ 0 \\ -2 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -3 \\ 7 \\ 2 \\ 5 \end{bmatrix} \right\}$

linearly dependent

contains the zero vector.

3 Determine if **b** lies in the span of the given vectors.

$$\mathbf{b} = \begin{bmatrix} 4 \\ 1 \\ -4 \end{bmatrix}; \quad \left\{ \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 8 \\ -2 \end{bmatrix}, \begin{bmatrix} 6 \\ 5 \\ 1 \end{bmatrix} \right\}$$

$$\left[\begin{array}{ccc|c} 2 & 0 & 6 & 4 \\ -1 & 8 & 5 & 1 \\ 1 & -2 & 1 & -4 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & -2 & 1 & -4 \\ 2 & 0 & 6 & 4 \\ -1 & 8 & 5 & 1 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & -2 & 1 & -4 \\ 0 & 4 & 4 & 12 \\ 0 & 6 & 6 & -3 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & -2 & 1 & -4 \\ 0 & 1 & 1 & 3 \\ 0 & 0 & 0 & 15 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & 0 & 3 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}\right]$$

We have an inconsistent system

$\vec{b}$ is not in the span.