Chapter 4.2

Linear Algebra with applications to differential equations

College of the Atlantic. Winter 2019

1. (Re)introduce yourself to your partners and briefly discuss a song or piece of music that you've been listening to a lot lately.

2. Let W consist of all vectors of the form $\vec{x} = (x_1, 0, x_3)$. Is W a subspace of $\mathbb{R}^3$?

3. Let W consist of the set of all vectors in $\mathbb{R}^3$ such that $x_2 = 1$. Is W a subspace of $\mathbb{R}^3$?

4. Let W consist of the set of all vectors in $\mathbb{R}^3$ such that $x_1 = 2x_2$. Is W a subspace of $\mathbb{R}^3$?

5. Let W consist of all vectors $\vec{x} = (x_1, x_2, x_3)$ such that $x_1 + x_2 + x_3 = 1$. Is W a subspace of $\mathbb{R}^3$?

6. Let W consist of all vectors $\vec{x}$ in $\mathbb{R}^5$ whose elements are all non-negative. Is W a subspace of $\mathbb{R}^5$?

7. Consider a homogeneous equation of the form $A\vec{x} = 0$, with x in $\mathbb{R}^4$. Let the reduced row echelon form of A be:

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

   Write the set of solutions in the form $s\vec{u} + t\vec{v}$.

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8. Determine if each of the following sets of vectors are linearly independent:

   (a) $\vec{v_1} = (1, 4, 0)$, $\vec{v_2} = (1, 2, -1)$, $\vec{v_3} = (1, 5, -2)$, $\vec{v_4} = (0, 1, 0)$.

   (b) $\vec{v_1} = (1, 2, 0)$, $\vec{v_2} = (1, 2, -1)$, $\vec{v_3} = (1, 0, 2)$.

   (c) $\vec{v_1} = (1, 2, 2, 1)$, $\vec{v_2} = (2, 3, 4, 1)$, $\vec{v_3} = (3, 8, 7, 5)$