Linear Algebra

Assignment 4 MATH 2318 (Fall 2022)

Deadline: Friday September 23rd, 11:59pm.

Policy to turn in assignment:

- Assignment should be submitted via BlackBoard.
- Student needs to turn in their assignment as a single PDF file.
- No email or late submission will be accepted.

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6 points

1. Determine if the set is linearly dependent or linearly independent. If it is linearly dependent, find a linear dependence relation.

   a) $\{\vec{v}_1, \vec{v}_2, \vec{v}_3, \vec{v}_4\}$, where $\vec{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 1 \\ 1 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} 3 \\ 0 \\ 2 \\ -2 \end{bmatrix}, \vec{v}_3 = \begin{bmatrix} 0 \\ 4 \\ -1 \\ 1 \end{bmatrix}, \vec{v}_4 = \begin{bmatrix} 5 \\ 0 \\ 3 \\ -1 \end{bmatrix}$.

   b) $\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$, where $\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} -1 \\ -3 \\ 2 \end{bmatrix}, \vec{v}_3 = \begin{bmatrix} 4 \\ 6 \\ -2 \end{bmatrix}$.

4 points

2. Let $\vec{v}_1 = \begin{bmatrix} -2 \\ 0 \\ 1 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} 1 \\ 1 \\ -3 \end{bmatrix}, \vec{v}_3 = \begin{bmatrix} -1 \\ -3 \\ r \end{bmatrix}$. Find the value of r so that the set $\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$ is linearly dependent. For that value of r, write $\vec{v}_1$ as a linear combination of $\vec{v}_2$ and $\vec{v}_3$.

4 points

3. For each of the following, determine if the statement is true or false. Provide a short reasoning (one or two sentences).

   a) If the set $\{\vec{v}_1, \vec{v}_2, \vec{v}_3, \vec{v}_4\}$ is linearly independent, then $\{\vec{v}_1, \vec{v}_2, \vec{v}_3, \vec{v}_1 + \vec{v}_4\}$ is linearly independent.

   b) If a set of vectors is linearly dependent then at least one of the vectors is a scalar multiple of another one.

   c) A set of 3 vectors in $\mathbb{R}^2$ is always linearly dependent.

   d) If $\{\vec{x}, \vec{y}\}$ is linearly independent, and if $\vec{z}$ is in Span$\{\vec{x}, \vec{y}\}$, then $\{\vec{x}, \vec{y}, \vec{z}\}$ is linearly dependent.