

Linear Algebra Homework 3

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1 Homework 3

This week's homework contains two parts, a written part and a SageMathCloud part:

- Written: For Wednesday, 2/11, you are to write up (neatly) and hand in problem 2.18 parts a, c, and d from Chapter 1, section II.2 (p. 47) on the dot product properties.
- SageMathCloud: Answer the following questions in this file, including any relevant Sage work under each problem. Delete cells that you do not want included.

When you need to enter text, start a new cell and type `%md` as the first thing in the cell. This will create a markdown cell. (Markdown can include formatting commands and even \LaTeX commands, if you wish, but you are not required to use any special formatting.) You can also click the "Text" button above to create an HTML cell, if you prefer.

This problem will be collected on SageMathCloud on Friday, 2/13, at noon. (You do not need to do anything except complete the problem on SageMathCloud in this file; I will collect the files automatically.)

1.1 Sage Problem

Here are three vectors:

$$\mathbf{v1} = \begin{pmatrix} 1 \\ -3 \\ 0 \\ -2 \end{pmatrix}, \quad \mathbf{v2} = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}, \quad \mathbf{v3} = \begin{pmatrix} -5 \\ 0 \\ 0 \\ 1 \end{pmatrix},$$

For each of the following vectors, decide if the vector is a linear combination of the vectors $\mathbf{v1}$, $\mathbf{v2}$, and $\mathbf{v3}$. (We will later say that a vector which is a linear combination of a set of vectors is in the span of the set, so we are really asking if these vectors are in the span of $\mathbf{v1}$, $\mathbf{v2}$, and $\mathbf{v3}$.)

Show evidence to support your claim.

a)

$$\begin{pmatrix} 3 \\ -14 \\ -5 \\ -12 \end{pmatrix}$$

b)

$$\begin{pmatrix} 1 \\ -2 \\ 5 \\ 0 \end{pmatrix}$$

c)

$$\begin{pmatrix} 17/6 \\ -1 \\ 0 \\ -7/6 \end{pmatrix}$$