

Name SOLUTION

Mathematics 1553

Quiz 3

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1. Write down one vector that is a linear combination of the following vectors.

$$\begin{pmatrix} 1 \\ -1 \end{pmatrix}, \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

$$3 \cdot \begin{pmatrix} 1 \\ -1 \end{pmatrix} + 5 \cdot \begin{pmatrix} -1 \\ 1 \end{pmatrix} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$$

2. Suppose that v_1, \dots, v_k are vectors. What is the *definition* of $\text{Span}\{v_1, \dots, v_k\}$?

The set of all linear
combinations of v_1, \dots, v_k

3. Say u and v are vectors in \mathbb{R}^3 and neither is a multiple of the other. Then $\text{Span}\{u, v\}$ is...

(a) a line through the origin

(b) the line through the origin and u plus the line through the origin and v

(c) a plane through the origin

(d) a plane, but not necessarily through the origin

Turn the page!

4. Is the vector $\begin{pmatrix} 3 \\ 9 \\ -4 \end{pmatrix}$ in the span of the columns of the matrix

$$\begin{pmatrix} 1 & -1 \\ 3 & -3 \\ -2 & 3 \end{pmatrix}?$$

If so, write it as a linear combination of the columns. If not, explain why not.

$$\left(\begin{array}{cc|c} 1 & -1 & 3 \\ 3 & -3 & 9 \\ -2 & 3 & -4 \end{array} \right) \rightsquigarrow \left(\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 0 & 0 \\ 0 & 1 & 2 \end{array} \right) \rightsquigarrow \left(\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{array} \right)$$

$$\rightsquigarrow \left(\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{array} \right)$$

Yes. $5 \cdot \begin{pmatrix} 1 \\ 3 \\ -2 \end{pmatrix} + 2 \cdot \begin{pmatrix} -1 \\ -3 \\ 3 \end{pmatrix} = \begin{pmatrix} 3 \\ 9 \\ -4 \end{pmatrix}$