

Worksheet 1.3 and 1.4, Vector Equations and The Matrix Equation

Worksheet Exercises

Recitations are meant to be active: students are encouraged to work with other students in recitation. As students are working through exercises, the TA should circulate around the room, helping students. Students may be asked to present their work using a document camera or write a solution on a whiteboard.

1. Written Explanation Exercise

- (a) What does the span of a set of vectors represent?
- (b) How do we determine whether a vector is in the span of a set of vectors?
- (c) Let b be a nonzero vector. Is it true that every linear combination of two solutions of $Ax = b$ is a solution of $Ax = b$? If you answer yes, explain why, if you answer no, given an example when a linear combination is not a solution.

2. Indicate whether the statements are true or false.

- a) If the equation $A\vec{x} = \vec{b}$ is inconsistent, then \vec{b} is not in the set spanned by the columns of A .
- b) If the augmented matrix $\begin{bmatrix} A & \vec{b} \end{bmatrix}$ has a pivot position in every row, then the equation $A\vec{x} = \vec{b}$ must be consistent.
- c) There are exactly three vectors in $\text{Span}\{\vec{a}_1, \vec{a}_2, \vec{a}_3\}$.

3. $\text{Span}\{\vec{v}_1, \vec{v}_2\}$ is equal to which of the expressions below?

- i) $\text{Span}\{\vec{v}_1, \vec{v}_2, 3\vec{v}_1\}$
- ii) $\text{Span}\{\vec{v}_1, 3\vec{v}_1\}$
- iii) $\text{Span}\{\vec{v}_1, \vec{v}_2, 3\vec{v}_1 + 2\vec{v}_2\}$

4. For what values of h is \vec{b} in the plane spanned by \vec{a}_1 and \vec{a}_2 ?

$$\vec{a}_1 = \begin{pmatrix} 1 \\ 4 \\ -1 \end{pmatrix}, \quad \vec{a}_2 = \begin{pmatrix} -6 \\ -17 \\ 2 \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} 4 \\ 2 \\ h \end{pmatrix}$$