

2022-23 First Semester
MATH1053 Linear Algebra I

Assignment 4b

Due Date: 15/Nov/2022 (Tuesday), 11:00 in class.

- Write down your **CHN name** and **student ID**. Write neatly on **A4-sized** paper (*staple if necessary*) and **show your steps**.
 - For online students, hand in your homework in **one pdf file** on iSpace.
 - **Late submissions or answers without steps won't be graded.**
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1. Determine whether the following sets form subspaces of \mathbb{R}^3

(a) $\{(x_1, x_2, x_3)^T \mid x_1 + x_3 = 1\}$

(b) $\{(x_1, x_2, x_3)^T \mid x_1 = x_2 = x_3\}$

2. Determine whether the following are subspaces of P_4 :

(a) The set S_1 of polynomials in P_4 of even degree.

(b) The set S_2 of all polynomials $p(x)$ in P_4 such that $p(0) = 0$.

3. Let U and V be subspaces of a vector space W . Define

$$U + V = \{\mathbf{z} \mid \mathbf{z} = \mathbf{u} + \mathbf{v}, \mathbf{u} \in U, \mathbf{v} \in V\}.$$

Show that $U + V$ is a subspace of W .

4. Determine the null space of each of the following matrices:

(a) $\begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$

(b) $\begin{pmatrix} 1 & 2 & -3 & -2 \\ -2 & -4 & 6 & 3 \end{pmatrix}$

5. Determine whether the following are spanning sets for \mathbb{R}^2 . Justify your answers.

(a) $\left\{ \begin{pmatrix} 2 \\ 1 \end{pmatrix}, \begin{pmatrix} 3 \\ 2 \end{pmatrix} \right\}$

(b) $\left\{ \begin{pmatrix} -1 \\ 2 \end{pmatrix}, \begin{pmatrix} 1 \\ -2 \end{pmatrix}, \begin{pmatrix} 2 \\ -4 \end{pmatrix} \right\}$