# University of Technology Sydney
# Department of Mathematical and Physical Sciences

## 37233 Linear Algebra
## Tutorial Assignment 6

**Question 1.**

Are the columns of $A = \begin{pmatrix} 2 & 3 & -2 & 0 & 4 & -1 \\ -1 & 0 & 2 & -1 & 3 & 0 \\ 1 & -2 & 4 & -5 & 3 & 3 \\ 2 & 1 & 4 & 4 & 1 & 2 \\ 4 & -2 & 1 & 10 & -3 & 0 \end{pmatrix}$ linearly independent? Justify your answer. (Hint: You may use a Theorem stated in the Week-5 lecture).

**Question 2.**

Are the columns of $A = \begin{pmatrix} 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{pmatrix}$ linearly independent? Justify your answer.

**Question 3.**

Determine whether or not the set

$$V = \{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4\} = \left\{ \begin{pmatrix} 1 \\ 2 \\ 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 1 \\ 3 \\ -1 \\ 2 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} -2 \\ 3 \\ 0 \\ 2 \end{pmatrix} \right\}$$

is linearly independent. If it is linearly dependent, identify the linear dependence relations

**Question 4.**

Explain why the columns of

$$A = \begin{pmatrix} 1 & 0 & 2 & -1 & 0 \\ 3 & 0 & 2 & -1 & 4 \\ 1 & 0 & 1 & 1 & 0 \\ 3 & 2 & 3 & 2 & 0 \end{pmatrix}$$

cannot be a basis for $\mathbb{R}^4$.

**Question 5.**

Let $\mathcal{B}$ be a basis for $\mathbb{R}^4$

$$\mathcal{B} = \left\{ \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ 3 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} \right\}.$$

Find $\mathbf{x}$ given $[\mathbf{x}]_{\mathcal{B}} = \begin{pmatrix} 0 \\ -2 \\ 1 \\ 2 \end{pmatrix}$.