University of Technology Sydney
Department of Mathematical and Physical Sciences

37233 Linear Algebra
Tutorial Assignment 8

Question 1.

Find the rank of matrix $\mathbf{A}$

$$\mathbf{A} = \begin{pmatrix} 1 & 2 & -3 & 1 & 1 \\ -3 & 1 & 7 & -1 & 1 \\ -2 & 3 & 4 & 0 & 2 \end{pmatrix}.$$

Question 2.

Find a basis and the dimension of the row space of matrix $\mathbf{A}$ given in **Question 1**.

Question 3.

Let $\mathbf{A}$ be 7×9 matrix with $dim\, Nul\, \mathbf{A} = 2$. Will the system $\mathbf{Ax} = \mathbf{b}$ have a solution for any $\mathbf{b}$?

Question 4.

Let $\mathcal{B} = \{\mathbf{b_1}, \mathbf{b_2}\}$ and $\mathcal{C} = \{\mathbf{c_1}, \mathbf{c_2}\}$ be bases for a vector space V and $\mathbf{b_1} = -\mathbf{c_1} + 4\mathbf{c_2}$ and $\mathbf{b_2} = 5\mathbf{c_1} - 3\mathbf{c_2}$.

Find $[\mathbf{x}]_{\mathcal{C}}$ for $\mathbf{x} = 5\mathbf{b_1} + 3\mathbf{b_2}$.

Question 5.

Let $\mathcal{B} = \{\mathbf{b_1}, \mathbf{b_2}\}$ and $\mathcal{C} = \{\mathbf{c_1}, \mathbf{c_2}\}$ be bases for $\mathcal{R}^2$

$$\mathbf{b_1} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}, \mathbf{b_2} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}; \mathbf{c_1} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}, \mathbf{c_2} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}.$$

Find the change-of-coordinate matrix from $\mathcal{B}$ to $\mathcal{C}$.