University of Technology Sydney

School of Mathematical and Physical Sciences

37233 Linear Algebra

Tutorials 2019 — Assignment 1 (40 marks)

Question 1 (8 marks)

Solve the linear system

$$\begin{aligned} x_1 - 2x_2 - 4x_3 + 4x_4 &= -1 \\ -3x_1 + 6x_2 + 4x_3 + 3x_4 &= 10 \\ -2x_1 + 4x_2 + 2x_3 + 2x_4 &= 6 \\ -x_1 + 2x_2 - 2x_3 + 2x_4 &= 1 \end{aligned}$$

Question 2 (8 marks)

Find all solutions of the system:

$$\begin{aligned} 3x_1 + 6x_2 + x_3 - 2x_4 - 4x_5 &= -6 \\ x_1 + 2x_2 \qquad + x_4 \quad - x_5 &= -1 \end{aligned}$$

Question 3 (8 marks)

Calculate the determinants of matrices $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 8 & 9 & 4 \\ 7 & 6 & 5 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 0 & 1 & 2 & 3 \\ 0 & 1 & 6 & 0 \\ 1 & 1 & 2 & 0 \\ 1 & -2 & 0 & 3 \end{bmatrix}$.

Question 4 (8 marks)

Determine whether $\mathbf{A} = \begin{bmatrix} 1 & 0 & 7 \\ -1 & 2 & 0 \\ -2 & 5 & 3 \end{bmatrix}$ is singular, and if it is not, find its inverse.

Question 5 (8 marks)

Determine the value of a_{11} for which the matrix below is singular:

$$\mathbf{A} = \begin{bmatrix} a_{11} & 2 & 1 \\ 5 & -1 & 2 \\ -3 & 1 & -1 \end{bmatrix}$$