# The University of Nottingham

School of Mathematical Sciences

A LEVEL 1 MODULE, AUTUMN 2019-2020

**LINEAR MATHEMATICS**

# COURSEWORK

**Submission Deadline: 4pm December 20th 2019**

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*Candidates' submission status will be recorded after collection, then all submission will be passed to relevant module convenor for marking.*

*Candidates' MATLAB scripts should be clearly set out, with comment statements.*

*To submit your coursework, please compress all the relevant files into a zip file.*

**Problem 1:** [7 marks]

(a) Download the 'drawLA', which is a draw toolbox for linear algebra, from Mathworks® File Exchange. Use `drawVector()` to draw two 2-D vectors:

$$\vec{a} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}; \vec{b} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}.$$

(b) Define the following matrics using MATLAB **built-in** functions and relevant matrix operations:

$$\mathbf{A}_1 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 \\ 2 & 2 & 0 & 0 \\ 2 & 2 & 2 & 0 \end{pmatrix}; \mathbf{A}_2 = \begin{pmatrix} 4 & 3 & 2 & 1 \\ 0 & 4 & 3 & 2 \\ 0 & 0 & 4 & 3 \\ 0 & 0 & 0 & 4 \end{pmatrix}; \mathbf{A}_3 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 2 & 0 & 3 & 0 \\ 0 & 4 & 0 & 5 \\ 0 & 0 & 6 & 0 \end{pmatrix}.$$

(c) Define the following matrics using *'for'* loop:

$$\mathbf{B}_1 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 9 & 12 \\ 4 & 8 & 12 & 16 \end{pmatrix}; \mathbf{B}_2 = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 5 & 0 & 0 \\ 0 & 0 & 14 & 0 \\ 0 & 0 & 0 & 30 \end{pmatrix};$$

**Problem 2:** [7 marks]

(a) Use `linsolve()` to solve the following system of linear equations (three equations in three unknowns):

$$\begin{cases} 2x - 4y + z = 9 \\ -2x + y + 2z = 10 \\ x - 3y - 7z = -2 \end{cases}$$

(b) Find the inverse matrix of coefficients in a), $A^{-1}$, and use $A^{-1}$ to solve the system of linear equations.

Professional marks will be awarded for the format, style and structure of your answers. [1 marks]

**END OF THE COURSEWORK**