

TEST 2

1. Show whether or not the following matrix, P , is **idempotent** [4 marks]:

$$P = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

2. Give the elementary matrix needed to perform the following row operations on a 3×3 matrix [7 marks]:

- (a) Interchange *row 2* and *row 3*.
- (b) Add *row 1* **TO** *row 3*.
- (c) Divide *row 1* by 4, **AND** negate *row 2*.

3. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 & 3 \\ -2 & 1 & 5 \\ 4 & 1 & -2 \end{bmatrix}$, and $D = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}$.

Answer the following questions, but if the requested operation is not possible, simply write **"no solution"** [13 marks].

- (a) Evaluate $A + C$.
 - (b) Evaluate $2B - A$.
 - (c) What is the dimension of the solution to the matrix multiplication: $B \times C$?
 - (d) What is the dimension of the solution to the matrix multiplication: $A \times B$?
 - (e) Evaluate $D \times D^T$.
4. A system of equations has been put into an augmented matrix. Use *Gaussian elimination* to show the system is inconsistent [6 marks].

$$\left[\begin{array}{cccc|c} 1 & 3 & 2 & 0 & 1 \\ 1 & 0 & -1 & -3 & 2 \\ -1 & 2 & 3 & 5 & 0 \end{array} \right]$$

5. Put the following system of equations into an augmented matrix and perform row operations to get the matrix into **Row Reduced Echelon Form**. Give your answer as $x = \dots$, $y = \dots$, $z = \dots$.

Marks will be deducted if you leave your solution in matrix form! [10 marks].

$$\begin{array}{rcl} 2x + 3y + z & = & 0 \\ y - z & = & 2 \\ -x & = & -1 \end{array}$$