

## MA 203 Problems 2

1. Determine if the following system of linear equations is consistent.
  - (i)  $2x_1 - x_2 - x_3 + 4x_4 = -2$
  - (ii)  $2x_1 + 2x_3 + 3x_4 = 3$
  - (iii)  $4x_1 + 2x_2 + 12x_3 + 7x_4 = 1$
  - (iv)  $-2x_1 - x_2 - x_3 - x_4 = 2$
2. Solve the following system of equations by putting the augmented matrix into reduced echelon form.
  - (i)  $x_1 + x_2 + x_3 = 3$
  - (ii)  $2x_1 - x_3 - 3x_4 = 8$
  - (iii)  $-2x_1 + 4x_2 + 2x_3 = -4$
3. Find all of the solutions to the following system of linear equations.
  - (i)  $x_1 + 2x_2 + 2x_3 + 7x_4 = 1$
  - (ii)  $x_1 + 2x_2 + 3x_3 + 10x_4 = 2$
  - (iii)  $-x_1 - 2x_2 - 2x_3 - 6x_4 = 1$
4. Suppose we have a system of  $m$  linear equations in  $n$  unknowns, where  $m < n$ . With reference to the augmented matrix representing the system in reduced echelon form, briefly explain why the system is either inconsistent, or has infinitely many solutions, but not a unique solution.
5. Let  $A$  and  $I$  be the matrices

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{pmatrix}, \quad I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}.$$

Use row operations to transform  $A$  into a matrix identical to  $I$ . Simultaneously apply the same row operations to  $I$  that you apply to  $A$ , and call the resultant matrix  $B$ . Calculate  $AB$ .