

# Math115 Test 1

January 21st, 2009

Answer all part of the question and give complete reasons and checks for your answers. The parts of the questions are weighted as shown in square brackets on the right.

1. (a) Find all solutions to this system of equations by using row operations on the augmented matrix. [8]

$$\begin{aligned}10w + 2x - 4z &= 6 \\7w + 2x + y - 3z &= 3 \\9w + 6x + 7y - 5z &= -3\end{aligned}$$

- (b) Identify which of your solutions represents the particular solution and perform the check for this solution. [2]
- (c) Verify that the underlying matrix  $C$  from the left hand side of part (a) is produced by multiplying these two matrices together. What is the rank of  $A$ ? [2]

$$A := \begin{pmatrix} 3 & 1 \\ 2 & 1 \\ 2 & 3 \end{pmatrix}, \quad B := \begin{pmatrix} 3 & 0 & -1 & -1 \\ 1 & 2 & 3 & -1 \end{pmatrix}$$

- (d) Check that  $B$  multiplied by the solutions from (a) gives a simple answer, and explain what happens to the homogeneous solutions from (a). [3]
- (e) Create a  $3 \times 2$  matrix  $E$  with rank 1 and calculate  $F := EB$ . What are the solutions for the homogeneous equation with  $F$  and what is the rank of  $F$ ? [5]