MAT2705-02/05 15S Quiz 4   Print Name (Last, First) _____|__

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use arrows and equal signs when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC).

1. $x_1 - 2 x_2 - 5 x_3 - 12 x_4 = 1$

   $2 x_1 + 3 x_2 + 18 x_3 + 11 x_4 = 9$

   $2 x_1 + 5 x_2 + 26 x_3 + 21 x_4 = 11$

a) Write down the coefficient matrix $\mathbf{A}$, the RHS matrix $\vec{\mathbf{b}}$ and the augmented matrix $\mathbf{C} = \langle \mathbf{A} \mid \vec{\mathbf{b}} \rangle$ for this linear system of equations.

b) With technology (identify your choice!), reduce this matrix $\mathbf{C}$ step by step to its ReducedRowEchelonForm avoiding fractions, recording the intermediate matrices and row operations for each step (as in

$R_1 \leftrightarrow R_2, R_3 \rightarrow R_3 + 2 R_1, R_1 \rightarrow \dfrac{1}{2} R_1$). You may combine the AddRow operations within a single pivot, reporting only the final matrix.

c) Write out the equations that correspond to the reduced matrix. Identify the leading variables and the free variables and solve. State your solution in the scalar form: $x_1 = ..., x_2 = ...,$ etc .

d) Does it agree with the technology solution of the original system? If not, there must be a mistake somewhere.

2. a) Use technology to solve the following system (recall the instruction to identify your choice of technology, and perhaps you should rewrite these equations first lining up the variables):

   $x_1 - x_3 = 0, x_1 - x_4 = 0, 4 x_1 - x_5 = 0, x_2 - 2 x_5 = 0, x_2 - x_3 - 2 x_4 - 2 x_6 = 0$

 b) This has a lowest (positive) integer solution representing the balance of the chemical reaction

$KMnO_4 + HCl = KCl + MnCl_2 + H_2 O + Cl_2.$ Write out this lowest integer solution and check that it satisfies the final equation of this system.

▶ **solution**