MAT2705-04/05 23S Test 2 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 equal signs and arrows 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). **You may use technology for row reductions, determinants and matrix inverses without showing details (identify technology).** Otherwise only use technology to CHECK hand calculations, not subsitute for them, unless specifically requested.

pledge **[sign and date the pledge at the end of your exam]**

When you have completed the exam, please read and sign the dr bob integrity pledge and hand this test sheet on top of your answer sheets as a cover page:
"During this examination, all work has been my own. I have not accessed any of the class web pages or any other sites during the exam. I give my word that I have not resorted to any ethically questionable means of improving my grade or anyone else's on this examination and that I have not discussed this exam with anyone other than my instructor, nor will I until after the exam period is terminated for all participants."

Signature: Date:

1. a) Write the following system of equations in matrix form (as a matrix equation!):

$$x_1 + 3x_2 - 4x_3 - 8x_4 = 6$$
$$x_1 + 2x_3 + x_4 = 3$$
$$2x_1 + 7x_2 - 10x_3 - 19x_4 = 13$$

b) Write down the augmented matrix and its reduced row echelon form. To check you entered the correct matrix, your reduced augmented matrix entry at the end of the first row should be 3.
c) Label each column by its corresponding variable and identify leading and free variables.
d) Write down the three reduced equations and solve the system, expressing the solution as a column matrix equation.
e) Rewrite this equation with its right hand side as an explicit linear combination of a constant vector x_p plus a vector x_h containing the arbitrary parameters. The latter is the solution of the associated homogeneous system of equations setting the right hand side to zero.
f) Write down the column matrix vectors which are a basis of the homogeneous solution space like you did in the homework.

2. Check the following sets of vectors for linear independence by solving the matrix equation $\langle v_1|v_2|v_3\rangle < x_1, x_2, x_3 > = \langle 0, 0, 0, 0\rangle$ for the column matrix of unknown coefficients, identifying leading and free variables, etc. One set is linearly independent and one is linearly dependent. If linearly independent state why. If linearly dependent, state the simplest linear combination which equals the zero vector.
a) $v_1 = \langle 1, 1, -1, 1\rangle$, $v_2 = \langle 2, 1, 1, 1\rangle$, $v_3 = \langle 3, 1, 4, 2\rangle$.
b) $v_1 = \langle 3, 0, 1, 2\rangle$, $v_2 = \langle 1, -1, 0, 1\rangle$, $v_3 = \langle 1, 2, 1, 0\rangle$.

3. Use the inverse matrix (from technology) to solve the following linear system of equations

$$3x_1 - 4x_2 + 2x_3 = 0,\ -2x_1 + 3x_3 = -7,\ x_1 + x_2 - 3x_3 = 6$$

showing your matrix multiplication steps matching row and column entries before multiplying and adding to prove you can matrix multiply by hand.