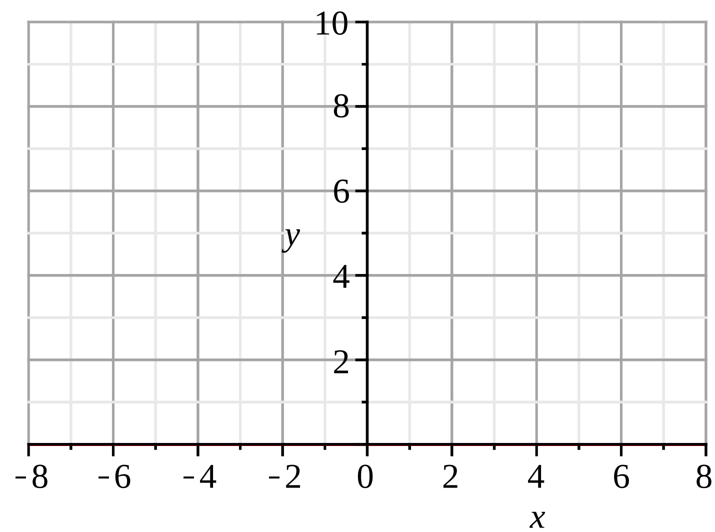
MAT2705-02/06 09F Test 2   Print Name (Last, First) ________________________________|__

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 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). **You may use technology for row reductions, determinants and matrix inverses.**

1. a) On the grid to the right, draw in arrows representing the vectors $\vec{v}_1 = \langle 3, 2\rangle$ and $\vec{v}_2 = \langle -1, 1\rangle$ and $\vec{v}_3 = \langle 2, 8\rangle$. Then draw in the parallelogram that graphically expresses $\vec{v}_3$ as a linear combination of $\{\vec{v}_1, \vec{v}_2\}$. From the grid, read off the coordinates (y_1, y_2) of $\vec{v}_3$ with respect to these two vectors and express $\vec{v}_3$ as a linear combination of them. Explain how you got these numbers.
b) Now write down the matrix equation that enables you to express $\vec{v}_3$ as a linear combination of the other two vectors, solve that system using matrix methods, and then express $\vec{v}_1$ explicitly as a linear combination of those vectors.
c) Check your linear combination by expanding it out to get the original vector. Did you?
d) Does your matrix result agree with part a)?



2. a) For $A = \langle \vec{v}_1 | \vec{v}_2 | \vec{v}_3 | \vec{v}_4 \rangle$ with , $\vec{v}_1 = \langle 2, 1, -1\rangle$; $\vec{v}_2 = \langle 1, 2, -3\rangle$, $\vec{v}_3 = \langle -3, 0, -1\rangle$, $\vec{v}_4 = \langle 3, -2, 2\rangle$ and $\vec{x} = \langle x_1, x_2, x_3, x_4\rangle$, solve the equations $A\,\vec{x} = \vec{0}$, writing down the augmented matrix and its RREF form, identifying Leading and Free variables, and stating your result for $\vec{x}$.
b) From your general solution write down a basis $\{\vec{u}_1, ...\}$ of the solution space.
c) There is one independent relationship among these 4 vectors. Write down a single linear combination of these vectors equal to the zero vector and solve it for the last vector which enters the relationship. What are the remaining vectors of the set? Do these form a basis of R^3 ? Explain why or why not.

3. a) Can $\vec{v}_4 = \langle 6, 4, 2, 0\rangle$ be expressed in terms of $\vec{v}_1 = \langle 2, 1, 2, 1\rangle$; $\vec{v}_2 = \langle 1, 2, 3, 4\rangle$; $\vec{v}_3 = \langle 3, 4, 1, 2\rangle$? If so, do so and check that your expression reduces to $\vec{v}_4$ If not explain why not. Show all work to support your claim.

▶ solution

▼ pledge

When you have completed the exam, please read and sign the dr bob integrity pledge and hand this test sheet in on top of your answer sheets as a cover page, with the first test page facing up:
"During this examination, all work has been my own. 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: