University of Toronto MAT188H1F Quiz, Friday Oct 4, 2013

 Name:
 Tutorial:

Only aids permitted: a Casio FX-991 or Sharp EL-520 calculator. Present your solutions to the following questions in the space provided. The value of each question is indicated in parentheses beside the question number. **Total Marks:** 20.

1. (6 marks) Convert the given system of linear equations

 $\begin{cases} x_1 + 2x_2 + x_3 + 2x_4 = -1 \\ x_1 + 7x_2 + 4x_3 + 3x_4 = -2 \\ 2x_1 - x_2 + x_3 - 3x_4 = 5 \end{cases}$

to an augmented matrix and then find all solutions by first reducing the augmented matrix to reduced echelon form.

2. (5 marks) Find a set of vectors $\{\mathbf{u}, \mathbf{v}\}$ in \mathbb{R}^4 that spans the solution set of the equations

$$\begin{cases} x_1 + 3x_2 - x_3 + 2x_4 = 0\\ 2x_1 + 6x_2 + 2x_3 &= 0\\ 3x_1 + 9x_2 - 7x_3 + 10x_4 = 0 \end{cases}$$

3. (5 marks) Find all values of h such that the set of vectors $\{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3\}$ spans \mathbb{R}^3 if

$$\mathbf{a}_1 = \begin{bmatrix} 2\\4\\5 \end{bmatrix}, \mathbf{a}_2 = \begin{bmatrix} h\\2\\-8 \end{bmatrix}, \mathbf{a}_3 = \begin{bmatrix} 1\\2\\6 \end{bmatrix}.$$

- 4. (4 marks) Indicate if the following statements are True or False, and give a brief explanation why.
 - (a) (2 marks) Four non-zero vectors in \mathbb{R}^4 must span \mathbb{R}^4 .

(b) (2 marks) If A is a matrix with columns that span \mathbb{R}^n , then $A \mathbf{x} = \mathbf{b}$ has a solution for all vectors \mathbf{b} in \mathbb{R}^n .