MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 2.1 **Math 2050 Worksheet** WINTER 2013

For practice only. Not to be submitted.

1. Let vectors $\mathbf{u} = \begin{bmatrix} 4 \\ -1 \\ -1 \\ 7 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ 0 \\ 2 \\ 0 \end{bmatrix}$. Let A be the matrix whose columns are $\mathbf{u}$ and $\mathbf{v}$ so $A = \begin{bmatrix} \mathbf{u} & \mathbf{v} \\ \downarrow & \downarrow \\ & \end{bmatrix}$ and let B be the matrix whose rows are the tranposes of $\mathbf{u}$ and $\mathbf{v}$, so $B = \begin{bmatrix} \mathbf{u}^T & \rightarrow & \\ \mathbf{v}^T & \rightarrow & \end{bmatrix}$.
   (a) What is the size of A? What is the size of B?
   (b) Identify the elements a_{11}, a_{33}, a_{42}, b_{12}, b_{21} and b_{42}, if possible.

2. Write the system of equations
$$\begin{aligned} 4w - 3x - y + z &= 5 \\ 6x + 2z &= -3 \\ -w + 5x - y - \frac{7}{3}z &= 0 \end{aligned}$$
as a matrix equation of the form $A\mathbf{x} = \mathbf{b}$. (You do <u>not</u> need to solve for w, x, y or z.)

3. Solve the equation $A - 4X = \frac{1}{3}B^T$ where $A = \begin{bmatrix} 2 & 0 & -4 \\ -1 & -1 & 7 \\ 0 & 8 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 3 \\ -2 & 6 & 0 \\ 0 & -3 & 9 \end{bmatrix}$.

4. Given $A = \begin{bmatrix} 1 & 4 \\ -5 & 6 \\ 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 0 & -4 \\ 3 & -2 & 1 \\ -1 & -2 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 6 & 1 & 0 & -2 \\ 1 & \frac{3}{2} & 0 & -8 \end{bmatrix}$, compute each of the following products, if possible. If a product does not exist, explain why not.
   (a) AB (b) BA (c) A^TB
   (d) AC (e) C^TA^T (f) B^2
   (g) C^2 (h) BAC (i) ACA

5. Give an example of two non-zero 2×2 matrices A and B for which $AB = \mathbf{0}$.

6. Express $\begin{bmatrix} -10 \\ 13 \\ -10 \end{bmatrix}$ as a linear combination of the columns of $A = \begin{bmatrix} 4 & -1 & 0 \\ 0 & 1 & 3 \\ 0 & 0 & -2 \end{bmatrix}$.