MEMORIAL UNIVERSITY OF NEWFOUNDLAND DEPARTMENT OF MATHEMATICS AND STATISTICS

Assignment 4 MATH 2050 Due: Thur June 7

1. Find matrix A if

$$\begin{bmatrix} 5 & 1 \\ 0 & -2 \end{bmatrix} - 2A = \begin{bmatrix} -3 & 2 \\ -1 & 7 \end{bmatrix} + A^T.$$

- 2. Let A, B, C be symmetric matrices. Determine whether A + B + C is symmetric. What about ABC?
- 3. Consited matrices

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 2 \\ 1 & 0 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 2 & -3 \\ -1 & 0 & 2 \end{bmatrix}, \quad C = \begin{bmatrix} 3 & 2 & 0 \end{bmatrix}.$$

Find the following products if they are defined

$$AB, AC, CA, AB^T, A^TB, A^2, B^2, C^2$$

4. A square matrix P is called **idempotent** if P² = P. Show that if P is idempotent and I is a unit matrix then (I - P)² is also idempotent.
Bonus: Show that P + AP - PAP is idempotent given that P is idempotent, and A is

any square matric of the same size as P.

5. Write the following system of linear equations in the form AX = B

 $5x_1 - 6x_2 - 2x_3 - 7 = 0, \quad 2x_1 + 17x_3 + 14 = 0, \quad 20x_1 + x_2 - x_4 - 10 = 0, \quad x_2 + x_4 - 1 = 0, \quad x_1 + x_5 = 0$

namely, identify matrices A, X, B and their dimensions.

6. Given augmented matrix for a homogeneous system of linear equations find the basic solutions and write the parametric solution in the vector form

$$\begin{bmatrix} 1 & -2 & 3 & -4 & 5 & -1 & 0 \\ 0 & 0 & 0 & 5 & 7 & 1 & 0 \\ 0 & 0 & 0 & 0 & 4 & 12 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

7. Compose a word problem whose solution leads to matrix multiplication.