UNIVERSITY OF MANITOBA **SUMMER 2015**
DEPARTMENT OF MATHEMATICS

MATH-1300 VECTORS GEOMETRY AND LINEAR ALGEBRA
ASSIGNMENT #4-UNIT 4

1. Given the three matrices $A = \begin{pmatrix} 2 & -3 & 1 \\ 0 & 4 & 6 \\ -1 & 3 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 4 & 5 \\ -1 & 3 \end{pmatrix}$ and $C = \begin{pmatrix} 1 & 4 & 3 \\ 2 & 5 & -2 \\ 0 & -1 & 2 \end{pmatrix}$
   a) Evaluate $A + 2C$
   b) Evaluate $B^T B$
   c) Evaluate C^2

2. Given the matrix $A = \begin{pmatrix} 1 & -2 & 3 \\ -2 & 1 & 4 \\ 5 & 3 & 2 \end{pmatrix}$
   a) Determine whether A is invertible. Justify your answer.
   b) If A is invertible find its inverse A^{-1}.

3. Use the inverse of the matrix of the coefficients to solve of the linear system of equations
   $\begin{cases} 3x + y = 3 \\ -x + 2y = 4 \end{cases}$

4. A rental car agency has two locations in Winnipeg: Downtown location (labeled location 1) and East end location (labeled location 2) . Cars can be picked-up at any one of the two locations and returned to any other location including the location it was picked-up at. The agency's statistician has determined the following: 30% of cars pick up at location 1 are returned to location 1 and 60% of cars pick up at location 2 are return to location 1.

   a) Determine the transition matrix T.
   b) If the state vector at the first observation is $X(0) = \begin{pmatrix} 0.4 \\ 0.6 \end{pmatrix}$, find $X(2)$ the state vector at the third observation period.
   c) Find the steady-state vector