MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 5 **MATH 2050** DUE: FRIDAY MAY 22

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1. Find the inverse of each of the following matrices or explain why it is not possible.

$$A = \begin{bmatrix} 10 & 2 \\ 5 & 4 \end{bmatrix}, \qquad B = \begin{bmatrix} 10 & 2 \\ 5 & 1 \end{bmatrix}. \qquad C = \begin{bmatrix} 2 & -1 & 3 \\ 3 & 1 & -1 \\ 1 & 1 & -2 \end{bmatrix},$$

$$D = \begin{bmatrix} 1 & -1 & 2 \\ -5 & 7 & -11 \\ -2 & 3 & -5 \end{bmatrix}. \qquad F = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \qquad G = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 3 & 3 & 3 \end{bmatrix}.$$

2. Solve the system of equations by writing it in the form $AX = B$ and finding A^{-1}. Check your answer.

   (a) $\begin{cases} x - 7y = 11 \\ -x + 2y = -1 \end{cases}$

   (b) $\begin{cases} 10x + 15y = 5 \\ 101x + 203y = 102 \end{cases}$

   (c) $\begin{cases} 2x - y + 3z = 3 \\ 3x + y - z = -2 \\ x + y - 2z = 0 \end{cases}$

   (d) $\begin{cases} 2x - y + 3z = 0 \\ 3x + y - z = 11 \\ x + y - 2z = 7 \end{cases}$

3. Explain why each of the following matrices is elementary. Find its inverse in the easy way.

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 10 \end{bmatrix}, C = \begin{bmatrix} 1 & 0 & 4 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, D = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -3 & 0 & 0 & 1 \end{bmatrix},$$

4. True of False? Explain.

   a) If a matrix has an inverse then it must be a square matrix.

   b) Every square matrix is invertable.

   c) There exists a non-invertable elementary matrix.

   d) If matrix A is invertable then the system $AX = B$ has a unique solution for any vector-column B.