MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 4 **MATHEMATICS 2050** WINTER 2026

Due: Friday, February 20th, 2026 at 6:00pm. See the Gradescope Handout for submission information.

> **Note:** You should complete the worksheets for Sections 2.1 and 2.2 before you work on this assignment.

1. Suppose $A = \begin{bmatrix} 5 & 2 & -1 & 3 \\ 0 & 7 & 7 & 1 \\ -4 & -1 & 0 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 0 & 0 \\ 1 & -1 & -2 \\ -2 & 0 & 6 \\ 0 & 9 & 4 \end{bmatrix}$. Compute each of the following products, or explain why it is not possible to do so.

   (a) AB

   (b) BA

   (c) B^2

2. A matrix A is said to be **idempotent** if $A = A^2$. Determine all values of x and y for which the matrix $A = \begin{bmatrix} x & 6 \\ -1 & y \end{bmatrix}$ is idempotent.

3. Use the matrix inverse to solve the system of equations

$$-x + 5y = 3$$
$$2x - 7y = 6.$$

4. Explain why the matrix inverse cannot be used to solve the system of equations

$$3x - 6y = 12$$
$$-2x + 4y = -8.$$

5. Suppose A, B and X are invertible matrices such that

$$BX^{-1}A = AB.$$

   Find an expression for X in terms of A and B.

6. Prove that if A is a square matrix then

$$(A^T)^{-1} = (A^{-1})^T.$$