MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 2 **MATHEMATICS 2050** March 23rd, 2026

Name	**MUN Number**

1. Consider the matrices $A = \begin{bmatrix} 3 & -2 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -1 \\ 0 & 3 \\ -2 & 2 \end{bmatrix}$.

[10] (a) Evaluate each of the following, or explain why it is not possible to do so:

$$A + A^T, \quad AB, \quad BA, \quad A^2, \quad A^{-1}, \quad B^{-1}.$$

[6] (b) Write A as a product of elementary matrices.

[8] 2. (a) Solve the following homogeneous system of equations using Gaussian elimination. If a solution exists, express it as a vector or as a linear combination of vectors.

$$\left.\begin{aligned} x - 4y + 2z &= 0 \\ -2x + 5y - 4z &= 0 \\ 3x - 7y + 6z &= 0 \end{aligned}\right\}$$

[2] (b) Given that $\begin{bmatrix} 4 \\ 2 \\ -1 \end{bmatrix}$ is a particular solution to the system

$$\left.\begin{aligned} x - 4y + 2z &= -6 \\ -2x + 5y - 4z &= 6 \\ 3x - 7y + 6z &= -8 \end{aligned}\right\}$$

use your answer to part (a) to write a general solution of this non-homogeneous system.

[2] (c) Using your answer to part (a), deduce whether the vectors $\mathbf{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$, $\mathbf{v}_2 = \begin{bmatrix} -4 \\ 5 \\ -7 \end{bmatrix}$ and $\mathbf{v}_3 = \begin{bmatrix} 2 \\ -4 \\ 6 \end{bmatrix}$ are linearly independent or linearly dependent. Explain your answer.

[6] 3. Find conditions on k such that the following system has no solutions.

$$\left.\begin{aligned} x - 2y &= k \\ 3x - 3y &= 1 \\ -x + 3y &= 0. \end{aligned}\right\}$$

[6] 4. Use Gaussian elimination to find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & -1 & 1 \\ 3 & 5 & 7 \end{bmatrix}$.
