ASSIGNMENT 6 **MATHEMATICS 2050** WINTER 2026

Due: Friday, March 13th, 2026 at 6:00pm. See the Gradescope Handout for submission information.

> **Note:** You should complete the worksheets for Sections 2.4 and 2.5 before you work on this assignment.

1. Consider the system

$$\left.\begin{array}{rcl} x - 2y - 3z &=& 2 \\ y - 9z &=& 5 \\ -3x + 7y &=& -1. \end{array}\right\}$$

   (a) Solve the corresponding homogeneous system of equations using Gaussian elimination and back-substitution.

   (b) Show that the solution of the given system can be written in the form $\mathbf{x} = \mathbf{x}_p + \mathbf{x}_h$, where $\mathbf{x}_p$ is a particular solution of the given system and $\mathbf{x}_h$ is a solution of the corresponding homogeneous system.

2. Use Gaussian elimination and back-substitution to determine whether the vectors

$$\mathbf{v}_1 = \begin{bmatrix} 7 \\ -2 \\ 0 \\ 5 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 3 \\ 1 \\ -1 \\ -4 \end{bmatrix}, \quad \mathbf{v}_3 = \begin{bmatrix} 0 \\ 2 \\ 8 \\ 3 \end{bmatrix}, \quad \mathbf{v}_4 = \begin{bmatrix} 0 \\ -3 \\ -7 \\ 0 \end{bmatrix}$$

   are linearly independent or linearly dependent.

3. For each of the following matrices, use Gaussian elimination to determine the inverse of the matrix or to show that the matrix is not invertible.

   (a) $A = \begin{bmatrix} 0 & 4 & -1 & 1 \\ 2 & 0 & 0 & -2 \\ 1 & 0 & -1 & 3 \\ 0 & 2 & 1 & -1 \end{bmatrix}$

   (b) $B = \begin{bmatrix} 2 & 0 & -2 & 3 \\ 1 & -1 & 1 & 0 \\ -4 & 3 & -3 & 0 \\ -3 & -2 & 0 & 3 \end{bmatrix}$

4. Express $A = \begin{bmatrix} 0 & -3 & 6 \\ 1 & 0 & 4 \\ 0 & 0 & 1 \end{bmatrix}$ as a product of elementary matrices.