MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 1 **MATHEMATICS 2050** WINTER 2026

Due: Friday, January 23rd, 2026 at 6:00pm. See the Gradescope Handout for submission information.

> **Note:** You should complete the worksheets for Sections 1.1 and 1.2 before you work on this assignment.

1. Determine the values of x and y for which the vectors

$$\begin{bmatrix} x \\ -3 \\ 7 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} -4 \\ 2 \\ y \end{bmatrix}$$

are parallel.

2. Determine whether $\begin{bmatrix} 3 \\ -3 \\ 2 \end{bmatrix}$ is a linear combination of the following vectors.

(a) $\begin{bmatrix} 0 \\ -9 \\ 3 \end{bmatrix}, \quad \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \quad \begin{bmatrix} -3 \\ 6 \\ 0 \end{bmatrix}$

(b) $\begin{bmatrix} 0 \\ -9 \\ 3 \end{bmatrix}, \quad \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \quad \begin{bmatrix} 5 \\ 1 \\ -2 \end{bmatrix}$

3. Consider the vector $\mathbf{u} = \begin{bmatrix} 2 \\ -6 \\ -3 \end{bmatrix}$.

   (a) Determine the unit vector that lies in the opposite direction to $\mathbf{u}$.

   (b) Find all values of x for which $\mathbf{u}$ is orthogonal to the vector $\mathbf{v} = \begin{bmatrix} x^2 \\ 3x \\ -1 \end{bmatrix}$.

4. If $\mathbf{u}$ is a vector of length 3, $\mathbf{v}$ is a unit vector, and $\mathbf{u} \cdot \mathbf{v} = -2$, find

$$(\mathbf{u} + 4\mathbf{v}) \cdot (\mathbf{v} - \mathbf{u}).$$