MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 3   **MATHEMATICS 2050**   WINTER 2026

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

> **Note:** You should complete the worksheet for Sections 1.4 and 1.5 before you work on this assignment.

1. Consider the point $P(0, 4, -1)$ and the line ℓ with equation

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 2 \\ -3 \end{bmatrix} + t \begin{bmatrix} 3 \\ 5 \\ 0 \end{bmatrix}.$$

   (a) Find the distance from P to ℓ.

   (b) Determine the point lying on ℓ which is closest to P.

2. Let π be the plane with equation $-3x + y - 4z = 1$ and ℓ be the line with equation

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -4 \\ 7 \\ 3 \end{bmatrix} + t \begin{bmatrix} 1 \\ -5 \\ -2 \end{bmatrix}.$$

   (a) Show that π and ℓ are parallel.

   (b) Determine the distance from π to ℓ.

3. Determine whether each of the following sets of vectors is linearly independent or linearly dependent.

   (a) $\mathbf{u_1} = \begin{bmatrix} 1 \\ -6 \\ -3 \end{bmatrix}$, $\mathbf{u_2} = \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix}$, $\mathbf{u_3} = \begin{bmatrix} 0 \\ -8 \\ 1 \end{bmatrix}$

   (b) $\mathbf{u_1} = \begin{bmatrix} 2 \\ 6 \\ -4 \\ -4 \end{bmatrix}$, $\mathbf{u_2} = \begin{bmatrix} 7 \\ 3 \\ 1 \\ 3 \end{bmatrix}$, $\mathbf{u_3} = \begin{bmatrix} -4 \\ 6 \\ -7 \\ -9 \end{bmatrix}$