SECTION 1.4   **Math 2050 Worksheet**   WINTER 2026

For practice only. Not to be submitted.

1. Given vectors $\mathbf{u} = \begin{bmatrix} 1 \\ 4 \\ -5 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -3 \\ -1 \\ -2 \end{bmatrix}$, find the projection of $\mathbf{u}$ onto $\mathbf{v}$ and the projection of $\mathbf{v}$ onto $\mathbf{u}$.

2. Find the distance from the point $P(0, -1, 1)$ to the line ℓ defined by the equation

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \\ 4 \end{bmatrix} + t \begin{bmatrix} -1 \\ 0 \\ 3 \end{bmatrix}.$$

3. (a) Find the distance from the point $P(-7, -2, -2)$ to the plane π with equation $-x + y - 3z = 4$.

   (b) Identify the point lying on π which is closest to P.

4. (a) Find two orthogonal vectors which lie in the plane π whose equation is $6x - y - z = 0$.

   (b) Find the projection of $\mathbf{w} = \begin{bmatrix} 0 \\ 8 \\ 3 \end{bmatrix}$ onto π.