

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 1.5

Math 2050 Worksheet

WINTER 2026

For practice only. Not to be submitted.

1. Find a vector of length 4 in the same direction as $\mathbf{u} = \begin{bmatrix} 4 \\ -1 \\ -1 \\ 6 \end{bmatrix}$.

2. Find the angle (in radians and degrees, to one decimal place) between $\mathbf{u} = \begin{bmatrix} 4 \\ 2 \\ 0 \\ 2 \\ -1 \end{bmatrix}$ and

$$\mathbf{v} = \begin{bmatrix} -3 \\ 9 \\ 1 \\ 0 \\ 3 \end{bmatrix}.$$

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

(a) $\mathbf{u} = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 6 \\ 7 \end{bmatrix}$

(b) $\mathbf{u} = \begin{bmatrix} 2 \\ 5 \\ -1 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 0 \\ -1 \\ -1 \end{bmatrix}$, $\mathbf{w} = \begin{bmatrix} 3 \\ 2 \\ -4 \end{bmatrix}$

(c) $\mathbf{u} = \begin{bmatrix} 2 \\ 5 \\ -1 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 0 \\ -1 \\ -1 \end{bmatrix}$, $\mathbf{w} = \begin{bmatrix} 2 \\ 2 \\ -4 \end{bmatrix}$

(d) $\mathbf{u} = \begin{bmatrix} 2 \\ 5 \\ -1 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 0 \\ -1 \\ -1 \end{bmatrix}$, $\mathbf{w} = \begin{bmatrix} 3 \\ 2 \\ -4 \end{bmatrix}$, $\mathbf{x} = \begin{bmatrix} -4 \\ 0 \\ 6 \end{bmatrix}$

(e) $\mathbf{u}_1 = \begin{bmatrix} 5 \\ 0 \\ 1 \\ 3 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} 1 \\ 5 \\ -1 \\ -2 \end{bmatrix}$, $\mathbf{u}_3 = \begin{bmatrix} -3 \\ 6 \\ -1 \\ 0 \end{bmatrix}$, $\mathbf{u}_4 = \begin{bmatrix} 2 \\ -2 \\ 7 \\ 0 \end{bmatrix}$

4. Prove that if \mathbf{u} is a vector in \mathbb{R}^n which is orthogonal to every vector in \mathbb{R}^n then \mathbf{u} must be the zero vector.