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.