

Instructions: Please answer the following legibly, logically, and **show all work**. Please use a **separate sheet of paper** to write all work. No credit will be given for unjustified or unclear work. When you are finished, please scan your work (or take pictures) and submit via the Assignments or Quiz link on Canvas.

$$\text{Let } \mathbf{u} = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}, \text{ and } \mathbf{v} = \begin{bmatrix} 3 \\ -4 \\ 1 \end{bmatrix}$$

1. Find the length of $2\mathbf{u}$ and the length of $-\mathbf{v}$.
2. Find the distance between \mathbf{u} and \mathbf{v} .
3. Are \mathbf{u} and \mathbf{v} orthogonal to each other? Show work, and explain why or why not.
4. Normalize the vector $\mathbf{u} + \mathbf{v}$.