MATH 335 Quiz 9 Name:

Show all work. 5 points each.

1. Let $\mathbf{u} = \begin{bmatrix} 2 \\ -5 \\ -1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -7 \\ -4 \\ 6 \end{bmatrix}$. Verify $\mathbf{u} \perp \mathbf{v}$ and $\|\mathbf{u}\|^2 + \|\mathbf{v}\|^2 = \|\mathbf{u} + \mathbf{v}\|^2$

2. Compute the orthogonal projection $\hat{\mathbf{y}} = \left(\frac{\mathbf{y} \cdot \mathbf{u}}{\mathbf{u} \cdot \mathbf{u}}\right) \mathbf{u}$ where $\mathbf{y} = \begin{bmatrix} 1 \\ 7 \end{bmatrix}$ and $\mathbf{u} = \begin{bmatrix} -4 \\ 2 \end{bmatrix}$.

Extra credit(2 pts) Find the vector $\mathbf{z}$ so $\mathbf{y} = \hat{\mathbf{y}} + \mathbf{z}$ and $\mathbf{z}$ is orthogonal to $\mathbf{u}$