Math 2568, Quiz #14, Fall 2014 Name KEY

**Instructions**: Show all work. Answer each question as completely as possible. Use exact values (yes, that means fractions!).

1. Determine if the set of vectors $\left\{\begin{bmatrix}3\\-2\\3\end{bmatrix}, \begin{bmatrix}-1\\3\\-3\end{bmatrix}, \begin{bmatrix}3\\8\\7\end{bmatrix}\right\}$ is mutually orthogonal.

$\vec{v}_1 \cdot \vec{v}_2 = -3 - 6 - 9 = -18$

$\vec{v}_2 \cdot \vec{v}_3 = -3 + 24 - 21 = 0$

$\vec{v}_1 \cdot \vec{v}_3 = 9 - 16 + 21 = 14$

$\vec{v}_2$ & $\vec{v}_3$ are orthogonal, the others are not.

2. If $\vec{y} = \begin{bmatrix}2\\6\end{bmatrix}$, write this vector as orthogonal components $\vec{y}_{\parallel}$ and $\vec{y}_{\perp}$ relative to the subspace $W = \left\{\begin{bmatrix}7\\1\end{bmatrix}\right\}$.

$\frac{14+6}{49+1} = \frac{20}{50} = \frac{2}{5}$

$y_{\parallel} = \frac{2}{5}\begin{bmatrix}7\\1\end{bmatrix} = \begin{bmatrix}14/5\\2/5\end{bmatrix}$

$y_{\perp} = \begin{bmatrix}2\\6\end{bmatrix} - \begin{bmatrix}14/5\\2/5\end{bmatrix} = \begin{bmatrix}-4/5\\28/5\end{bmatrix}$