Name: _____

206 Quiz 2

1. (a) Define a *linear combination* of vectors $\mathbf{v}_1, \ldots, \mathbf{v}_n$.

   (b) Show that $\mathbf{b} = \begin{bmatrix} 0 \\ 6 \\ 6 \end{bmatrix}$ is a linear combination of $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} -4 \\ -1 \\ -1 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$. Find all such possible linear combinations.

2. Consider the linear transformations $T, S : \mathbb{R}^2 \to \mathbb{R}^2$ where T rotates a vector by $5\pi/6$ radians, and S projects a vector onto the y-axis.

   (a) Find the matrix representations of T and S.

   (b) Draw a picture showing that $S(T(\mathbf{x})) \neq T(S(\mathbf{x}))$. Then use the answer to part a to find the matrices of the linear transformations $S(T(\mathbf{x}))$ and $T(S(\mathbf{x}))$.