Quiz 4

Summer 2011

Math 1180 **Your name:** ____________________

1. [5 points] Show that the vectors $\bar{\mathsf{v}}_1 = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}$, $\bar{\mathsf{v}}_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$, and $\bar{\mathsf{v}}_3 = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ form an orthogonal basis for $\mathbb{R}^3$. Then find the coordinate vector $[\bar{\mathsf{w}}]_{\mathcal{B}}$ of $\bar{\mathsf{w}} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ with respect to the basis $\mathcal{B} = \{\bar{\mathsf{v}}_1, \bar{\mathsf{v}}_2, \bar{\mathsf{v}}_3\}$.

2. [5 points] Determine whether

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$$

is diagonalizable and, if so, find an invertible matrix P and a diagonal matrix D such that $P^{-1}AP = D$.

3. [5 points] Let W be the subspace spanned by the vectors $\bar{\mathsf{w}}_1 = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}$ and $\bar{\mathsf{w}}_2 = \begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix}$. Find a basis for $W^\perp$.

bonus problem [5 points extra] Show that the matrices $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ are similar.