Math 2568, Quiz #9, Summer 2013 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round.

1. Consider the basis for $\mathbb{R}^4$ given by the vectors: $\left\{\begin{bmatrix}1\\1\\1\\1\end{bmatrix}, \begin{bmatrix}1\\-1\\1\\1\end{bmatrix}, \begin{bmatrix}1\\1\\-1\\1\end{bmatrix}, \begin{bmatrix}1\\1\\1\\-1\end{bmatrix}\right\}$. Find the representation of the vector $\vec{v} = \begin{bmatrix}4\\0\\-2\\3\end{bmatrix}$ in this basis.

$P_B = \begin{bmatrix}1&1&1&1\\1&-1&1&1\\1&1&-1&1\\1&1&1&-1\end{bmatrix}$ $\quad [\vec{v}]_B = P_B^{-1}\vec{v} = \begin{bmatrix}-3/2\\2\\3\\1/2\end{bmatrix}$

2. Given a matrix A which you know to be 6x9 and had 5 pivots, answer the following questions:
   a. What is the rank of the matrix?

   5

   b. What is the dimension of Nul A?

   $9-5=4$

   c. What space are the vectors in Nul A in?

   $\mathbb{R}^9$

   d. Is the transformation one-to-one?

   no, there are free variables

   e. Is it onto?

   no, only 5 not 6 pivots.

   f. What is the range of A, and does it span all of that space?

   $\mathbb{R}^6$, no, only a 5-dim subspace