Quiz 4; Tuesday, September 27
MATH 54 with Ming Gu
GSI: Eric Hallman

Student name:

You have 15 minutes to complete the quiz. Calculators are not permitted.

1. (4 points) If $\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2\} = \left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \end{bmatrix} \right\}$ and $\mathbf{x} = \begin{bmatrix} 4 \\ -1 \end{bmatrix}$, find $[\mathbf{x}]_{\mathcal{B}}$.

2. (4 points) Find bases for the null space **and** the column space of $\begin{bmatrix} 1 & 2 & 3 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$. Be sure to state which basis is which.

3. (4 points) Mark each statement as True or False. You do not have to explain your reasoning.

   (a) There are exactly three 2-dimensional subspaces of $\mathbb{R}^3$.

   (b) Every 2-dimensional vector space is isomorphic to $\mathbb{R}^2$.

   (c) If $T : V \to W$ is an isomorphism between n-dimensional vector spaces and $\{v_1, \ldots, v_n\}$ are linearly independent in V, then $\{T(v_1), \ldots, T(v_n)\}$ span W.

   (d) The null space of A is equal to the column space of A^T.