Math 250–Spring 2013
Quiz 1 - February 7, 2013 Name: ______________________________

This quiz requires little to no computational work. You have 8 minutes.

1. (*5 points*) Let $A = \begin{pmatrix} a & 2 & c \\ 1 & b & 3 \end{pmatrix}$, let $\vec{u} = \begin{pmatrix} -2 \\ \pi \end{pmatrix}$, and let $\vec{v} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$.

(a) Is A a 2×3 matrix or a 3×2 matrix? What is the $(1,2)$-entry of A?

(b) Does $A\vec{u}$ make sense? If so, what is it?

(c) Does $A\vec{v}$ make sense? If so, what is it?

2. (*5 points*) Circle each matrix below that is in reduced row echelon form, and put an X through those that are not.

$$\begin{pmatrix} 1 & 3 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 1 & 0 & -17 & 0 \\ 0 & 0 & 1 & \pi & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 1 & a & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad \begin{pmatrix} 0 & 1 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$

3. (*10 points*) Suppose $\vec{u}_1, \vec{u}_2, \ldots, \vec{u}_k$ are vectors in $\mathbb{R}^n$, and suppose A is the matrix given by

$$A = \begin{pmatrix} | & | & & | \\ \vec{u}_1 & \vec{u}_2 & \cdots & \vec{u}_k \\ | & | & & | \end{pmatrix}.$$

Circle **every** statement below that is equivalent to (the *exact* same thing as) the following statement (put an X through those that are not):

"The vector $\vec{b}$ is in $\text{Span}\left(\left\{\vec{u}_1, \vec{u}_2, \ldots, \vec{u}_k\right\}\right)$."

(a) The vector $\vec{b}$ can be written as a linear combination of the vectors $\vec{u}_1, \vec{u}_2, \ldots, \vec{u}_k$.

(b) There are scalars $\lambda_1, \lambda_2, \ldots, \lambda_k$ such that $\vec{b} = \sum_{i=1}^{k} \lambda_i \vec{u}_i = \lambda_1 \vec{u}_1 + \lambda_2 \vec{u}_2 + \cdots + \lambda_k \vec{u}_k$.

(c) The matrix equation $A\vec{x} = \vec{b}$ is consistent.

(c) The matrix equation $A\vec{x} = \vec{b}$ is inconsistent.

(e) There exists a vector $\vec{x}$ in $\mathbb{R}^n$ such that $A\vec{x} = \vec{b}$.

(f) There exists a vector $\vec{x}$ in $\mathbb{R}^k$ such that $A\vec{x} = \vec{b}$.

(g) The rref of the matrix A **does** have a row of the form $(0, 0, \ldots, 0, 1)$.

(h) The rref of the matrix A **does not** have a row of the form $(0, 0, \ldots, 0, 1)$.

(i) The rref of the augmented matrix $\left(A \mid \vec{b}\right)$ **does** have a row of the form $(0, 0, \ldots, 0, 1)$.

(j) The rref of the augmented matrix $\left(A \mid \vec{b}\right)$ **does not** have a row of the form $(0, 0, \ldots, 0, 1)$.