Practice Test 3D for Calculus II, Math 1502, October 19, 2012

Name:

Section:

Name of TA:

This test is to be taken without calculators and notes of any sorts. The allowed time is 50 minutes. Provide exact answers; not decimal approximations! For example, if you mean $\sqrt{2}$ do not write $1.414\ldots$. Show your work, otherwise credit cannot be given.
Write your name, your section number as well as the name of your TA on EVERY PAGE of this test. This is very important.

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I: (20 points) a) Are the following vectors linearly independent?

$$\begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 4 \\ -3 \end{bmatrix}$$

b) Is the vector

$$\begin{bmatrix} 1 \\ 6 \\ -2 \end{bmatrix}$$

in the span of the above vectors?

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II: (20 points) Let $f : \mathcal{R}^2 \to \mathcal{R}^3$ be a linear transformation such that

$$f(\begin{bmatrix} 1 \\ 1 \end{bmatrix}) = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \text{ and } f(\begin{bmatrix} 1 \\ -1 \end{bmatrix}) = \begin{bmatrix} 0 \\ -1 \\ 2 \end{bmatrix} .$$

Find all vectors $\vec{x} \in \mathcal{R}^2$ such that

$$f(\vec{x}) = \begin{bmatrix} 7 \\ 17 \\ 15 \end{bmatrix}$$

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III: (20 points) Let $T : \mathcal{R}^3 \to \mathcal{R}^4$ be a linear transformation and assume that T is one-to-one. Draw all the possible echelon forms for the matrix associated with T, i.e., the matrix A such that $T(\vec{x}) = A\vec{x}$.

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IV: (20 points) Let $f : \mathcal{R}^3 \to \mathcal{R}^3$ that rotates any vector about the z-axis in the positive sense by an angle $\pi/2$. Let g be the corresponding rotation that rotates each vector about the x-axis by an angle $\pi/2$ in the positive sense. Find the matrix associated with $g \circ f$.

V: (20 points) Use row reduction to find an equation for all the vectors

$$\vec{b} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

such that the system of equations $A\vec{x} = \vec{b}$ has a solution. Here

$$A = \begin{bmatrix} 2 & 3 & 2 \\ 1 & 5 & -6 \\ -3 & -2 & -8 \end{bmatrix}$$