Practice Test 3A for Calculus II, Math 1502, October 18, 2010

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

$$f\left(\begin{bmatrix} 1 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \ , \ f\left(\begin{bmatrix} 1 \\ -1 \end{bmatrix}\right) = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}$$

Find the matrix A_f associated with f.

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II: (25 points) a) Given two vectors

$$\vec{x} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} \ , \ \vec{v} = \begin{bmatrix} 1 \\ 2 \\ 2 \\ 4 \end{bmatrix} \ .$$

Find the component $\vec{x}_{||}$ of $\vec{x}$ parallel to $\vec{v}$ and the component $\vec{x}_{\perp}$ of $\vec{x}$ perpendicular to $\vec{v}$. Check your answer!

b) Find the distance between the tip of $\vec{x}$ and the line that passes through the origin and has direction $\vec{v}$.

c) Find the angle between the vector $\vec{x}$ and the vector $\vec{v}$.

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III: (25 points) a) Find the inverse of the matrix

$$A = \begin{bmatrix} 2 & 4 & 0 \\ 1 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix} .$$

Check your answer!

b) The unit cube is panned by the vector $\vec{e}_1, \vec{e}_2, \vec{e}_3$. Find the volume of the image of this unit cube under the matrix A.

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IV: (25 points) a) Find the plane in parametrized form that passes through points

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \quad \begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}, \quad \begin{bmatrix} 1 \\ 2 \\ 6 \end{bmatrix}$$

b) Find the equation for the plane.