Georgia Tech School of Mathematics
Math 1502

Calculus II, Section D

Quiz # 5

October 1st, 2008

First Name : _____

Last Name : _____

1. Let $f(\begin{bmatrix} x \\ y \end{bmatrix}) = \begin{bmatrix} \cos x \\ \sin x \cos y \\ \sin x \sin y \end{bmatrix}$ and let $g(\begin{bmatrix} x \\ y \\ z \end{bmatrix}) = \begin{bmatrix} y^2 + z^2 \\ x^2 + y^2 + z^2 \end{bmatrix}$.
   Compute $g \circ f$:

$$g \circ f(\begin{bmatrix} x \\ y \end{bmatrix}) \; =$$

2. Let f, g be the two transformations below. For each of them indicate whether it is linear (YES) or not (NO).

$$f(\begin{bmatrix} x \\ y \end{bmatrix}) = \begin{bmatrix} -x + 2y \\ x - y + 1 \end{bmatrix}, \qquad g(\begin{bmatrix} x \\ y \end{bmatrix}) = \begin{bmatrix} x - y \\ y/x \end{bmatrix}.$$

YES ☐ *NO* ☐ *YES* ☐ *NO* ☐

3. Let $A = \begin{bmatrix} 1 & 1 & -1 & 2 \\ 1 & 0 & 4 & -1 \\ 2 & -3 & 7 & 1 \\ 7 & 1 & 0 & 1 \end{bmatrix}$ and let $\mathbf{x} = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \end{bmatrix}$. Compute the second entry of $A\mathbf{x}$ without computing the whole vector $A\mathbf{x}$.

Result =

4. Compute the inverse of the 2×2 matrix $A = \begin{bmatrix} 3 & -1 \\ 1 & 1 \end{bmatrix}$.

$$A^{-1} = \begin{bmatrix} & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \end{bmatrix}$$

5. Let f be the linear transformation from $\mathbb{R}^2$ into $\mathbb{R}^2$ given first by reflecting about the line $y - x = 0$ and then by reflecting about the line $y = 0$. Compute the matrix A of this transformation :

   Hint : compute the images of the vectors in the canonical basis

$$A = \begin{bmatrix} & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \end{bmatrix}$$