Prof. Alexandru Suciu

MTH U371 **LINEAR ALGEBRA** **Spring 2006**

QUIZ 2

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1. [2 points] Find the matrix A of the linear transformation $T\colon \mathbb{R}^4 \to \mathbb{R}^3$ given by

$$y_1 = -x_1 + 3x_2 + 2x_3$$
$$y_2 = -5x_2 + 2x_3 - x_4$$
$$y_3 = 7x_1 + x_2 - 4x_3 + x_4$$

2. [4 points] Consider the linear transformation $T\colon \mathbb{R}^3 \to \mathbb{R}^2$, where

$$T\begin{bmatrix}1\\0\\0\end{bmatrix} = \begin{bmatrix}1\\2\end{bmatrix}, \qquad T\begin{bmatrix}0\\1\\0\end{bmatrix} = \begin{bmatrix}3\\4\end{bmatrix}, \qquad T\begin{bmatrix}0\\0\\1\end{bmatrix} = \begin{bmatrix}2\\-5\end{bmatrix}.$$

(a) Find the matrix A of T.

(b) Compute $T\begin{bmatrix}4\\-3\\7\end{bmatrix} =$

3. [4 points] Let

$$A = \begin{bmatrix}-1 & 4\end{bmatrix}, \qquad B = \begin{bmatrix}5 & -1\\2 & 3\end{bmatrix}, \qquad C = \begin{bmatrix}2 & 0 & 1\\0 & 2 & 3\end{bmatrix}.$$

Decide whether the following products are defined or not. If they are, compute them:

$$A \cdot B, \quad B \cdot A, \quad A \cdot C, \quad C \cdot A, \quad B \cdot C, \quad C \cdot B.$$

4. [5 points] Use Gaussian elimination to find the inverse of following matrix. Indicate for each step which row operation you use.

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

5. [5 points] For which choices of the constant k is the following matrix invertible?

$$A = \begin{bmatrix} 1 & 1 & 1 \\ k & 0 & -2 \\ 1 & k & 3 \end{bmatrix}$$

6. [5 points] Find the matrix A of the linear transformation $T\colon \mathbb{R}^2 \to \mathbb{R}^2$ with

$$T\begin{bmatrix} 6 \\ 5 \end{bmatrix} = \begin{bmatrix} 7 \\ -6 \end{bmatrix}, \quad T\begin{bmatrix} 4 \\ 3 \end{bmatrix} = \begin{bmatrix} -2 \\ 1 \end{bmatrix}.$$