PROF. A. SUCIU **MTH 1230 – LINEAR ALGEBRA** **FALL 1997**

QUIZ 2

1. (a) Find the LU-decomposition of $A = \begin{bmatrix} 3 & 0 & 1 \\ -6 & 4 & -3 \\ 3 & 2 & 1 \end{bmatrix}$.

   (b) Use the LU-decomposition of A from part (a) to solve $A \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 2 \end{bmatrix}$.

2. Use Gaussian elimination to find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 2 & 0 \\ 1 & 1 & 1 \end{bmatrix}$.

3. Consider the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

   (a) Find elementary matrices E_1, E_2, and E_3 such that $E_3 \cdot E_2 \cdot E_1 \cdot A = I$.

   (b) Use part (a) to express A as a product of elementary matrices.

   (c) Use part (a) to express A^{-1} as a product of elementary matrices.

   (d) Use part (c) to find A^{-1}.

4. Let $\vec{a} = \begin{bmatrix} 1 & 1 & -1 \end{bmatrix}$, $\vec{b} = \begin{bmatrix} 2 & 1 & 2 \end{bmatrix}$.

   (a) Find unit vectors in the direction of $\vec{a}$ and $\vec{b}$, respectively.

   (b) Find the lengths of $\vec{a}$ and $\vec{b}$, and compute the dot product $\vec{a} \cdot \vec{b}$.

   (c) Find the angle between $\vec{a}$ and $\vec{b}$. Are $\vec{a}$ and $\vec{b}$ orthogonal?

   (d) Find the projection of $\vec{a}$ onto $\vec{b}$.

   (e) Find the projection of $\vec{b}$ onto $\vec{a}$.