Linear Algebra
Quiz 6

Name:_____

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. Find the inverse of
$$\begin{bmatrix} 1 & 2 & 0 & 0 & 0 & 0 \\ 3 & 4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 2 & 0 & 0 \\ 0 & 0 & 3 & 4 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & -2 \\ 0 & 0 & 0 & 0 & -3 & -4 \end{bmatrix}.$$

The matrix is block diagonal of the form $\begin{bmatrix} A & 0 & 0 \\ 0 & A & 0 \\ 0 & 0 & -A \end{bmatrix}$, so its inverse has

the form $\begin{bmatrix} A^{-1} & 0 & 0 \\ 0 & A^{-1} & 0 \\ 0 & 0 & -A^{-1} \end{bmatrix}$ where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. We compute that $A^{-1} =$

$\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$, so the final answer is $\begin{bmatrix} -2 & 1 & 0 & 0 & 0 & 0 \\ \frac{3}{2} & -\frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & -2 & 1 & 0 & 0 \\ 0 & 0 & \frac{3}{2} & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 & -1 \\ 0 & 0 & 0 & 0 & -\frac{3}{2} & \frac{1}{2} \end{bmatrix}.$

2. Find an LU factorization of $\begin{bmatrix} 2 & -4 & 2 \\ -4 & 5 & 2 \\ 6 & -9 & 1 \end{bmatrix}.$

If the matrix of the problem is A, then Gaussian elimination shows that $A = LU$

where $L = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 3 & -1 & 1 \end{bmatrix}$ and $U = \begin{bmatrix} 2 & -4 & 2 \\ 0 & -3 & 6 \\ 0 & 0 & 1 \end{bmatrix}$