These homework problems are to be turned in and graded for credit. Turn in your work on separate pages, using this as a cover sheet. Please staple your work together. For full credit, you must show all of your work.

1. (a) If $A$ is invertible and $AB = AC$, prove quickly that $B = C$.
   
   (b) If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, find two different matrices such that $AB = AC$.

2. Find the inverses of
   
   $A = \begin{bmatrix} 0 & 0 & 0 & 2 \\ 0 & 0 & 3 & 0 \\ 0 & 4 & 0 & 0 \\ 5 & 0 & 0 & 0 \end{bmatrix}$ and $A = \begin{bmatrix} 3 & 2 & 0 & 0 \\ 4 & 3 & 0 & 0 \\ 0 & 0 & 6 & 5 \\ 0 & 0 & 7 & 6 \end{bmatrix}$

3. What three matrices $E_{21}$ and $E_{12}$ and $D^{-1}$ reduce $A = \begin{bmatrix} 1 & 2 \\ 2 & 6 \end{bmatrix}$ to the identity matrix? Multiply $D^{-1}E_{21}E_{12}$ to find $A^{-1}$.

4. What three elimination matrices $E_{21}$, $E_{31}$, and $E_{32}$ put $A$ into its upper triangular form $E_{32}E_{31}E_{21}A = U$? Multiply by $E_{32}^{-1}$, $E_{31}^{-1}$ and $E_{21}^{-1}$ to factor $A$ into $L$ times $U$:
   
   $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 2 & 2 \\ 3 & 4 & 5 \end{bmatrix}$
   
   $L = E_{21}^{-1}E_{31}^{-1}E_{32}^{-1}$

5. Factor matrix $A$ into $A = LU$.
   
   $A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$

   This is an example of a tridiagonal matrix because it only has non zeros on the main diagonal, and the two adjacent diagonals.