Show all appropriate work.

1. From the example we did in class, show that $PA = LU$.

2. Write MATLAB code to solve the following problems from the first homework.

   (a) Are the following vectors independent or dependent?

   $$\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ -2 \\ 2 \end{pmatrix}.$$

   (b) Find a basis for the subspace of $\mathbb{R}^5$ spanned by $\begin{pmatrix} 1 \\ 1 \\ -1 \\ 2 \\ 3 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \\ 2 \\ 3 \\ 3 \end{pmatrix}, \begin{pmatrix} -1 \\ 1 \\ -7 \\ 0 \\ 3 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ 3 \\ -3 \\ 6 \\ 9 \end{pmatrix}$.

   (c) Find the determinant of $A = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 5 & 0 \\ 7 & 3 & 4 & 2 \\ 10 & 2 & 5 & 3 \end{pmatrix}$.

   (d) factor the matrix $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ as $A = LU$.

   (e) Let

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

   Factor A as $A = LU$.

3. Let

   $$A = \begin{pmatrix} 2 & 1 & 2 \\ 4 & 1 & 3 \\ 2 & 2 & 1 \end{pmatrix}.$$

   Factor A as $A = LU$.

4. Write MATLAB code that solves $U\mathbf{x} = \mathbf{b}$, where U is an upper-triangular matrix, i.e. write code that performs back substitution.