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EX.2.4.3, Sauer3

Solve the system by finding the PA = LU factorization and then carrying out the two-step back substitution.

a.
$$\begin{pmatrix} 3 & 7 \\ 6 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 1 \\ -11 \end{pmatrix}$$
 b. $\begin{pmatrix} 3 & 1 & 2 \\ 6 & 3 & 4 \\ 3 & 1 & 5 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 3 \end{pmatrix}$

Hint: The two PA = LU factorization (with partial pivoting) are:

$$\left(\begin{array}{cc} 0 & 1 \\ 1 & 0 \end{array}\right) \left(\begin{array}{cc} 3 & 7 \\ 6 & 1 \end{array}\right) = \left(\begin{array}{cc} 1 & 0 \\ 1/2 & 1 \end{array}\right) \left(\begin{array}{cc} 6 & 1 \\ 0 & 13/2 \end{array}\right)$$

$$\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 3 & 1 & 2 \\ 6 & 3 & 4 \\ 3 & 1 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 1/2 & 1 & 0 \\ 1/2 & 1/2 & 1 \end{pmatrix} \begin{pmatrix} 6 & 3 & 4 \\ 0 & -1/2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$