check $PA = LU$

HW 16:

$$\begin{aligned} -3x_2 + 7x_3 &= 4 \\ x_1 + 2x_2 - x_3 &= 0 \\ 5x_1 - 2x_2 &= 3 \end{aligned}$$

$$A \to U = \begin{bmatrix} 0 & -3 & 7 \\ 1 & 2 & -1 \\ 5 & -2 & 0 \end{bmatrix} \qquad L \to P = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Pivot: $U = \begin{bmatrix} 5 & -2 & 0 \\ 1 & 2 & -1 \\ 0 & -3 & 7 \end{bmatrix} \qquad P = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

Eliminate: U_{21} & U_{31}

$U(2,:) - \frac{1}{5}(U(1,:)) = 1 \;\; 2 \;\; -1$

$\quad -1 \;\; +\frac{2}{5} \;\; +0$

$\quad 0 \;\; 2.4 \;\; -1$

$U(3,:) - \frac{0}{5}(U(1,:)) = 0 \;\; -3 \;\; 7$

$$L = \begin{bmatrix} 1 & 0 & 0 \\ 1/5 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$U = \begin{bmatrix} 5 & -2 & 0 \\ 0 & 2.4 & -1 \\ 0 & -3 & 7 \end{bmatrix}$$

$$U=\begin{bmatrix}5 & -2 & 0\\ 0 & 2.4 & -1\\ 0 & -3 & 7\end{bmatrix} \qquad L=\begin{bmatrix}1 & 0 & 0\\ 1/5 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$$

Pivot: $U=\begin{bmatrix}5 & -2 & 0\\ 0 & -3 & 7\\ 0 & 2.4 & -1\end{bmatrix}$ $L=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1/5 & 0 & 1\end{bmatrix}$ $P=\begin{bmatrix}0 & 0 & 1\\ 1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}$

Eliminate U_{32}:

$$U(3,:)-\frac{-2.4}{3}(U(2,:))=\begin{matrix}0 & 2.4 & -1\\ +0 & -2.4 & +5.6\\ 0 & 0 & 4.6\end{matrix} \qquad L=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1/5 & -.8 & 1\end{bmatrix}$$

$$U=\begin{bmatrix}5 & -2 & 0\\ 0 & -3 & 7\\ 0 & 0 & 4.6\end{bmatrix} \qquad P=\begin{bmatrix}0 & 0 & 1\\ 1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}$$

Check $\begin{bmatrix}0 & 0 & 1\\ 1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}\begin{bmatrix}0 & -3 & 7\\ 1 & 2 & -1\\ 5 & -2 & 0\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1/5 & .8 & 1\end{bmatrix}\begin{bmatrix}5 & -2 & 0\\ 0 & -3 & 7\\ 0 & 0 & 4.6\end{bmatrix}$

HW 16 pt 2:

$[L][d]=[P][B] \qquad [B]=\begin{bmatrix}4\\ 0\\ 3\end{bmatrix}$

Solve for $[d]$

$$\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ .2 & -.8 & 1\end{bmatrix}\begin{bmatrix}d_1\\ d_2\\ d_3\end{bmatrix}=\begin{bmatrix}0 & 0 & 1\\ 1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}\begin{bmatrix}4\\ 0\\ 3\end{bmatrix}$$

$d_1=3$
$d_2=4$
$d_3=2.6$

$1d_1+0d_2+0d_3=0\cdot4+0\cdot0+1\cdot3$
$0d_1+1d_2+0d_3=1\cdot4+0\cdot0+0\cdot3$
$\}$ →

$[U][x] = [d]$

Solve for x:

$$\begin{bmatrix} 5 & -2 & 0 \\ 0 & -3 & 7 \\ 0 & 0 & 4.6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 2.6 \end{bmatrix}$$

$x_1 = .5942$
$x_2 = -.01449$
$x_3 = .5652$

$$\left.\begin{aligned} 5x_1 - 2x_2 + 0x_3 &= 3 \\ 0x_1 - 3x_2 + 7x_3 &= 4 \\ 0x_1 + 0x_2 + 4.6x_3 &= 2.6 \end{aligned}\right\}$$