3.a

$$E_3 E_2 E_1 PA = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -\frac{2}{11} & 1 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 0 & \frac{11}{5} & \frac{27}{5} \\ 0 & \frac{2}{5} & \frac{14}{5} \end{bmatrix} = \begin{bmatrix} -5 & 2 & -1 \\ 0 & \frac{11}{5} & \frac{27}{5} \\ 0 & 0 & \frac{20}{11} \end{bmatrix} = U$$

$$U = E_3 P_3 E_2 P_2 E_1 P_1 A, \quad P_3 \,\&\, P_2 = I$$

$$\tilde{E}_3 \tilde{E}_2 \tilde{E}_1 \, P_3 P_2 P_1 A = U$$

$$P_3 P_2 P_1 A = (\tilde{E}_3 \tilde{E}_2 \tilde{E}_1)^{-1} U$$

$$\begin{bmatrix} -5 & 2 & -1 \\ 3 & 1 & 6 \\ 1 & 0 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -\frac{3}{5} & 1 & 0 \\ -\frac{1}{5} & \frac{2}{11} & 1 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 0 & \frac{11}{5} & \frac{27}{5} \\ 0 & 0 & \frac{20}{11} \end{bmatrix}$$

$$PA \quad = \quad LU$$