

### Πρόβλημα 4 (Λύση)

Πρέπει  $LU = A$ , αρα  $u_{15} = 3$  και  $l_{31} = 3$

$$LU \cdot x = b \Rightarrow \begin{matrix} U \cdot x = y \\ L \cdot y = b \end{matrix}$$

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 & 0 \\ 3 & -1 & 1 & 0 & 0 \\ 4 & 2 & 1 & -1 & 0 \\ 2 & 1 & -1 & -2 & 1 \end{pmatrix} \begin{pmatrix} y_1 = 4 \\ y_2 = 4 \\ y_3 = -1 \\ y_4 = 3 \\ y_5 = -2 \end{pmatrix} = \begin{pmatrix} 4 \\ 12 \\ 7 \\ 14 \\ 5 \end{pmatrix}$$

$$\begin{array}{l} \bullet 2 \cdot 4 + y_2 = 12 \\ \bullet 3 \cdot 4 - 4 + y_3 = 7 \\ \bullet 4 \cdot 1 + 2 \cdot 4 - 1 + y_4 = 14 \\ \bullet 2 \cdot 4 + 1 \cdot 4 + 1 - 6 + y_5 = 5 \end{array} \quad \left| \begin{array}{l} y_2 = 4 \\ 8 + y_3 = 7 \\ 11 + y_4 = 14 \\ 13 - 6 + y_5 = 5 \end{array} \right.$$

$$\begin{pmatrix} 1 & 1 & 1 & 2 & 3 \\ 0 & 2 & 2 & 3 & 1 \\ 0 & 0 & 3 & 3 & 2 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & -2 \end{pmatrix} \begin{pmatrix} x_1 = -1 \\ x_2 = 2 \\ x_3 = -2 \\ x_4 = 1 \\ x_5 = 1 \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \\ -1 \\ 3 \\ -2 \end{pmatrix}$$

$$\begin{array}{l} x_1 + 2 \cdot -2 + 2 \cdot 2 + 3 = 4 \quad | \quad x_1 = -1 \\ 2x_2 - 2 \cdot 2 + 3 \cdot 1 + 1 = 4 \quad | \quad x_2 = 2 \\ 3x_3 + 3 + 2 = -1 \quad | \quad x_3 = -2 \\ x_4 + 2 \cdot 1 = 3 \\ -2x_5 = -2 \end{array}$$

Συνεπώς  $X = [-1, 2, -2, 1, 1]^T$