



LU - decomposition

(for a square matrix)

$$A = \begin{pmatrix} 2 & 4 & 3 & 5 \\ -4 & -7 & -5 & -8 \\ 6 & 8 & 2 & 9 \\ 4 & 9 & -2 & 14 \end{pmatrix} \quad (4 \times 4 \text{ matrix})$$

$$= \begin{pmatrix} 1 & & & \\ & 1 & & \\ & & 1 & \\ & & & 1 \end{pmatrix} \cdot \begin{pmatrix} \boxed{2} & 4 & 3 & 5 \\ \boxed{-4} & -7 & -5 & -8 \\ \boxed{6} & 8 & 2 & 9 \\ \boxed{4} & 9 & -2 & 14 \end{pmatrix} \begin{array}{l} \text{put in L} \\ \text{II} - (-2) \cdot \text{I} \\ \text{III} - 3 \cdot \text{I} \\ \text{IV} - 2 \cdot \text{I} \\ \text{put in L} \end{array}$$

$$= \begin{pmatrix} 1 & & & \\ -2 & 1 & & \\ 3 & & 1 & \\ 2 & & & 1 \end{pmatrix} \cdot \begin{pmatrix} 2 & 4 & 3 & 5 \\ 0 & \boxed{1} & 1 & 2 \\ 0 & \boxed{-4} & -7 & -6 \\ 0 & \boxed{1} & -8 & 4 \end{pmatrix} \begin{array}{l} \text{put in L} \\ \text{III} - (-4) \cdot \text{II} \\ \text{IV} - 1 \cdot \text{II} \\ \text{put in L} \end{array}$$

$$= \underbrace{\begin{pmatrix} 1 & & & \\ -2 & 1 & & \\ 3 & -4 & 1 & \\ 2 & 1 & 3 & 1 \end{pmatrix}}_L \cdot \underbrace{\begin{pmatrix} 2 & 4 & 3 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -3 & 2 \\ 0 & 0 & 0 & -4 \end{pmatrix}}_U = A$$