

# Ejercicios Algebra Lineal - Metodos computacionales.

Sustitución hacia adelante.  
Sea una matriz triangular

inferior

$$\begin{cases} A_{11} x_1 & = b_1 \\ A_{21} x_1 + A_{22} x_2 & = b_2 \\ A_{31} x_1 + A_{32} x_2 + A_{33} x_3 & = b_3 \\ A_{41} x_1 + A_{42} x_2 + A_{43} x_3 + A_{44} x_4 & = b_4 \end{cases}$$

$$x_1 = \frac{b_1}{A_{11}}$$

$$A_{21} x_1 + A_{22} x_2 = b_2$$

$$b_2 - A_{21} x_1 = A_{22} x_2$$

$$A_{22} x_2 = b_2 - A_{21} x_1$$

$$x_2 = \frac{1}{A_{22}} (b_2 - A_{21} x_1)$$

$$x_3 = b_3 - (A_{31} x_1 + A_{32} x_2) \frac{1}{A_{33}}$$

$$x_4 = b_4 - (A_{41} x_1 + A_{42} x_2 + A_{43} x_3) \frac{1}{A_{44}}$$

Generalizando esto obtenemos que

$$x_i = \frac{1}{A_{ii}} \left( b_i - \sum_{j=1}^{i-1} A_{ij} x_j \right)$$

matriz triangular superior

$$\begin{cases} A_{11} x_1 + A_{12} x_2 + A_{13} x_3 + A_{14} x_4 = b_1 \\ A_{22} x_2 + A_{23} x_3 + A_{24} x_4 = b_2 \\ A_{33} x_3 + A_{34} x_4 = b_3 \\ A_{44} x_4 = b_4 \end{cases}$$

$$x_4 = \frac{b_4}{A_{44}}$$

$$x_3 = b_3 - (x_4 A_{34}) \frac{1}{A_{33}}$$

$$x_2 = b_2 - (x_3 A_{23} + x_4 A_{24}) \frac{1}{A_{22}}$$

$$x_1 = b_1 - (A_{12} x_2 + A_{13} x_3 + A_{14} x_4) \frac{1}{A_{11}}$$

$$x_i = \frac{1}{A_{ii}} \left( b_i - \sum_{j=i+1}^n A_{ij} x_j \right)$$