Vectors and matrices

Let $A = \begin{bmatrix} 1 & 0 & 2 \\ 3 & 2 & 5 \\ 2 & -1 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 1 & 3 \\ 2 & -1 & 7 \\ 5 & 3 & 1 \end{bmatrix}$

(1) Compute $2A - 5B$ when

(2) Compute AB and BA

(4) compute Au and vA

when $u = [4 \; 1 \; 8]$

$v = \begin{bmatrix} -4 \\ 8 \\ 1 \end{bmatrix}$

Solving linear systems

(1) Solve

$$\begin{cases} 2x_1 - 5x_2 = -17 \\ 4x_1 + x_2 = -1 \end{cases}$$

$$\begin{cases} 2x_1 - 3x_2 = -17 \\ 4x_1 + x_2 = -1 \end{cases}$$

(2) Solve

$$\begin{cases} 2x_1 - 3x_2 + 5x_3 = -4 \\ 5x_1 + x_3 = 9 \\ -3x_1 + 2x_2 - 6x_3 = 2 \end{cases}$$

(3) write the following system in matrix form

(a)
$$\begin{cases} x_1 + 2x_2 - 7x_3 = 1 \\ 2x_2 + x_3 = 5 \\ x_1 - x_1 + 2x_3 = -\sqrt{2} \end{cases}$$

(b)
$$\begin{cases} 7x_1 - \sqrt{2}x_2 = 1 \\ -x_1 + 5x_2 = 17 \end{cases}$$

(4) write the following equation as a system

(a) $Ax = b$ with $A = \begin{bmatrix} 1 & 2 \\ -3 & 7 \end{bmatrix}$ $b = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$

(4) $Ax = b$ with $A = \begin{bmatrix} -7 & 2 & 3 \\ 1 & 0 & 6 \\ 9 & 1 & 0 \end{bmatrix}$ $b = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$

(5) Solve the following

use scipy.linalg.lu to compute the LU decomposition of A

(a) $Ax = b$

$$A = \begin{bmatrix} -1 & 5 \\ -2 & 12 \end{bmatrix}$$

$$b = \begin{bmatrix} 13 \\ 32 \end{bmatrix}$$

(b) $Ax = b$

$$A = \begin{bmatrix} 2 & 5 & -1 \\ 2 & 7 & -1 \\ -2 & -14 & 7 \end{bmatrix}$$

$$b = \begin{bmatrix} 15 \\ 21 \\ -- \end{bmatrix}$$

$$v = \begin{bmatrix} 21 \\ -54 \end{bmatrix}$$