

with(LinearAlgebra):

A := << 1, 2, 1 > | < 2, 4, 2 > | < 1, 1, 0 > >

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 1 \\ 1 & 2 & 0 \end{bmatrix} \quad (1)$$

ColumnSpace(A)

$$\left[\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} \right] \quad (2)$$

NullSpace(A)

$$\left\{ \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix} \right\} \quad (3)$$

CharacteristicPolynomial(A, λ)

$$\lambda^3 - 5\lambda^2 - 3\lambda \quad (4)$$

Eigenvectors(A, output='list')

$$\begin{bmatrix} \frac{5}{2} + \frac{1}{2}\sqrt{37} \\ \frac{5}{2} - \frac{1}{2}\sqrt{37} \\ 0 \end{bmatrix}, \left[\frac{7}{3} \frac{\frac{1}{2} + \frac{1}{2}\sqrt{37}}{\left(-\frac{3}{2} + \frac{1}{2}\sqrt{37}\right)\left(\frac{3}{2} + \frac{1}{2}\sqrt{37}\right)}, \right. \quad (5)$$

$$\frac{7}{3} \frac{\frac{1}{2} - \frac{1}{2}\sqrt{37}}{\left(-\frac{3}{2} - \frac{1}{2}\sqrt{37}\right)\left(\frac{3}{2} - \frac{1}{2}\sqrt{37}\right)}, -2], \left[\frac{1}{3} \frac{4 + \sqrt{37}}{-\frac{3}{2} + \frac{1}{2}\sqrt{37}}, \right.$$

$$\left. \frac{1}{3} \frac{4 - \sqrt{37}}{-\frac{3}{2} - \frac{1}{2}\sqrt{37}}, 1], [1, 1, 0] \right]$$