

with(LinearAlgebra) :

$A := \text{Matrix}(3, 3, [[2, 1, 1], [1, 2, 1], [1, 1, 2]])$

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$

(1)

$B := \text{Matrix}(2, 3, [[1, 2, 3], [4, 7, 8]])$

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 7 & 8 \end{bmatrix}$$

(2)

$B.A$

$$\begin{bmatrix} 7 & 8 & 9 \\ 23 & 26 & 27 \end{bmatrix}$$

(3)

A^2

$$\begin{bmatrix} 6 & 5 & 5 \\ 5 & 6 & 5 \\ 5 & 5 & 6 \end{bmatrix}$$

(4)

A^{-1}

$$\begin{bmatrix} \frac{3}{4} & -\frac{1}{4} & -\frac{1}{4} \\ -\frac{1}{4} & \frac{3}{4} & -\frac{1}{4} \\ -\frac{1}{4} & -\frac{1}{4} & \frac{3}{4} \end{bmatrix}$$

(5)

$A + 6A$

$$\begin{bmatrix} 14 & 7 & 7 \\ 7 & 14 & 7 \\ 7 & 7 & 14 \end{bmatrix}$$

(6)

$\text{ReducedRowEchelonForm}(A)$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(7)

$\text{Determinant}(A)$

4

(8)

$\text{Eigenvalues}(A)$

$$\begin{bmatrix} 4 \\ 1 \\ 1 \end{bmatrix} \quad (9)$$

Eigenvectors(A)

$$\begin{bmatrix} 4 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 & -1 & -1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \quad (10)$$

$v := \text{Matrix}(3, 1, [[1], [1], [1]])$

$$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad (11)$$

$A.v$

$$\begin{bmatrix} 4 \\ 4 \\ 4 \end{bmatrix} \quad (12)$$

Transpose(v).v

$$\begin{bmatrix} 3 \end{bmatrix} \quad (13)$$

$C := \text{Matrix}(3, 3, [[1, 2, 3], [3, 4, 5], [6, 7, 8]])$

$$\begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 6 & 7 & 8 \end{bmatrix} \quad (14)$$

Eigenvectors(C)

$$\begin{bmatrix} 0 \\ \frac{13}{2} + \frac{1}{2} \sqrt{229} \\ \frac{13}{2} - \frac{1}{2} \sqrt{229} \end{bmatrix}, \quad (15)$$

$$\left[\left[1, \frac{9 \left(\frac{35}{2} + \frac{3}{2} \sqrt{229} \right)}{\left(\frac{67}{2} + \frac{7}{2} \sqrt{229} \right) \left(\frac{11}{2} + \frac{1}{2} \sqrt{229} \right)} \right] \right]$$

$$\begin{aligned}
& \left[\frac{9 \left(\frac{35}{2} - \frac{3}{2} \sqrt{229} \right)}{\left(\frac{67}{2} - \frac{7}{2} \sqrt{229} \right) \left(\frac{11}{2} - \frac{1}{2} \sqrt{229} \right)}, \right. \\
& \left. \left[-2, \frac{3 \left(\frac{19}{2} + \frac{1}{2} \sqrt{229} \right)}{\frac{67}{2} + \frac{7}{2} \sqrt{229}}, \frac{3 \left(\frac{19}{2} - \frac{1}{2} \sqrt{229} \right)}{\frac{67}{2} - \frac{7}{2} \sqrt{229}} \right], \right. \\
& \left. \left[1, 1, 1 \right] \right] \\
& \text{evalf} \left(2^{\frac{1}{2}} \right) \\
& 1.414213562 \tag{16}
\end{aligned}$$

$$\begin{aligned}
& \text{evalf}(\text{Eigenvectors}(C)) \\
& \begin{bmatrix} 0. \\ 14.06637298 \\ -1.066372975 \end{bmatrix}, \begin{bmatrix} 1. & 0.3202326445 & -1.163369899 \\ -2. & 0.5921395869 & -0.2980219399 \\ 1. & 1. & 1. \end{bmatrix} \tag{17}
\end{aligned}$$

$$\begin{aligned}
& v := \text{Eigenvalues}(C) \\
& \begin{bmatrix} 0 \\ \frac{13}{2} + \frac{1}{2} \sqrt{229} \\ \frac{13}{2} - \frac{1}{2} \sqrt{229} \end{bmatrix} \tag{18}
\end{aligned}$$

$$\begin{aligned}
& v \\
& \begin{bmatrix} 0 \\ \frac{13}{2} + \frac{1}{2} \sqrt{229} \\ \frac{13}{2} - \frac{1}{2} \sqrt{229} \end{bmatrix} \tag{19}
\end{aligned}$$

$$\begin{aligned}
& v[2] \\
& \frac{13}{2} + \frac{1}{2} \sqrt{229} \tag{20}
\end{aligned}$$

$$E := \text{Eigenvectors}(C)[2]$$

$$\left[\left[\begin{array}{c} 1, \frac{9 \left(\frac{35}{2} + \frac{3}{2} \sqrt{229} \right)}{\left(\frac{67}{2} + \frac{7}{2} \sqrt{229} \right) \left(\frac{11}{2} + \frac{1}{2} \sqrt{229} \right)}, \frac{9 \left(\frac{35}{2} - \frac{3}{2} \sqrt{229} \right)}{\left(\frac{67}{2} - \frac{7}{2} \sqrt{229} \right) \left(\frac{11}{2} - \frac{1}{2} \sqrt{229} \right)} \end{array} \right], \right. \\ \left. \left[\begin{array}{c} -2, \frac{3 \left(\frac{19}{2} + \frac{1}{2} \sqrt{229} \right)}{\frac{67}{2} + \frac{7}{2} \sqrt{229}}, \frac{3 \left(\frac{19}{2} - \frac{1}{2} \sqrt{229} \right)}{\frac{67}{2} - \frac{7}{2} \sqrt{229}} \end{array} \right], \right. \\ \left. \left[\begin{array}{c} 1, 1, 1 \end{array} \right] \right] \quad (21)$$

evalf(E)

$$\left[\begin{array}{ccc} 1. & 0.3202326445 & -1.163369899 \\ -2. & 0.5921395869 & -0.2980219399 \\ 1. & 1. & 1. \end{array} \right] \quad (22)$$

?LinearAlgebra