

Step-1

A has $\lambda_1 = 2$ with eigen vector $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$

$\lambda_2 = 5$ with eigen vector $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

Then $\Lambda = \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix}$ is the diagonal matrix whose diagonal entries are the eigen values of A and $S = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ whose columns are the eigen vectors in the order of the eigen values of A

By the process of diagonalizations, we know that $A = S\Lambda S^{-1}$

$$= \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}^{-1}$$

$$= \begin{bmatrix} 2 & 5 \\ 0 & 5 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$$

$$= \boxed{\begin{bmatrix} 2 & 3 \\ 0 & 5 \end{bmatrix}}$$