

## Step-1

First we need to find pivots of  $A - \frac{1}{2}I$ .

$$A - \frac{1}{2}I = \begin{pmatrix} 2.5 & 3 & 0 \\ 3 & 5.9 & 7 \\ 0 & 7 & 7.5 \end{pmatrix}$$

Apply  $R_2 \rightarrow R_2 - \frac{3}{2.5}R_1$

$$\Rightarrow A - \frac{1}{2}I = \begin{pmatrix} 2.5 & 3 & 0 \\ 0 & 5.9 & 7 \\ 0 & 7 & 7.5 \end{pmatrix}$$

Apply  $R_3 \rightarrow R_3 - \frac{7}{5.9}R_2$

$$\Rightarrow A - \frac{1}{2}I = \begin{pmatrix} 2.5 & 3 & 0 \\ 0 & 5.9 & 7 \\ 0 & 0 & -0.805 \end{pmatrix}$$

Thus the pivots are  $\boxed{2.5, 5.9 \text{ and } -0.81}$ .

So,  $\boxed{\text{one Eigen value of } A - \frac{1}{2}I \text{ is negative}}$ .

$A - \frac{1}{2}I$  has negative pivot, so that  $A$  has Eigen value smaller than  $\frac{1}{2}$ .