

we know that

$$A = I A$$

$$\begin{bmatrix} 4 & 0 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - \frac{R_1}{2}$$

$$\begin{bmatrix} 4 & 0 \\ 0 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -\frac{1}{2} & 1 \end{bmatrix} A$$

$$R_1 \rightarrow R_1/4$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 5 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & 0 \\ -\frac{1}{2} & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2/5$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & 0 \\ -\frac{1}{10} & \frac{1}{5} \end{bmatrix} A$$

as $I = A^{-1}A$

$$\therefore A^{-1} = \begin{bmatrix} \frac{1}{4} & 0 \\ -\frac{1}{10} & \frac{1}{5} \end{bmatrix}$$