LU Decomposition, No pivoting

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1.0001 & 2 \\ 1 & 2 & 2 \end{pmatrix}$$

$$k = 1 \qquad\qquad i = 2$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} \boxed{1} & 1 & 1 \\ 1 & \mathbf{1.0001} & \mathbf{2} \\ 1 & 2 & 2 \end{pmatrix}}$$

$$R_2 \mapsto R_2 - \frac{1}{1} R_1$$

$$\begin{array}{rc} & \begin{pmatrix} \mathbf{1} & \mathbf{1.0001} & \mathbf{2} \end{pmatrix} \\ -\frac{1}{1} & \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \\ \hline & \begin{pmatrix} \mathbf{0} & \mathbf{0.0001} & \mathbf{1} \end{pmatrix} \end{array}$$

$$\begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{1} & \mathbf{1.0001} & \mathbf{2} \\ 1 & 2 & 2 \end{pmatrix}} = \begin{pmatrix} 1 & 1 & 1 \\ \mathbf{0} & \mathbf{0.0001} & \mathbf{1} \\ 1 & 2 & 2 \end{pmatrix}$$

$$k = 1 \qquad\qquad i = 2$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} \boxed{1} & 1 & 1 \\ \mathbf{1} & \mathbf{1.0001} & \mathbf{2} \\ 1 & 2 & 2 \end{pmatrix}}$$

$$R_2 \leftarrow\!\shortmid\; R_2 - \frac{1}{1} R_1$$

$$\begin{array}{rc} & \begin{pmatrix} \mathbf{1} & \mathbf{1.0001} & \mathbf{2} \end{pmatrix} \\ -\frac{1}{1} & \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \\ \hline & \begin{pmatrix} \mathbf{0} & \mathbf{0.0001} & \mathbf{1} \end{pmatrix} \end{array}$$

$$\boxed{\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{1} & \mathbf{1.0001} & \mathbf{2} \\ 1 & 2 & 2 \end{pmatrix}} = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \\ \mathbf{0} & \mathbf{0.0001} & \mathbf{1} \\ 1 & 2 & 2 \end{pmatrix}$$

$$k = 1 \qquad\qquad i = 2$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \boxed{1} & 1 & 1 \\ \mathbf{0} & \mathbf{0.0001} & \mathbf{1} \\ 1 & 2 & 2 \end{pmatrix}$$

$$k = 1 \qquad\qquad i = 3$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} \boxed{1} & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{1} & \mathbf{2} & \mathbf{2} \end{pmatrix}}$$

$$R_3 \mapsto R_3 - \frac{1}{1} R_1$$

$$\begin{array}{rc} & \begin{pmatrix} \mathbf{1} & \mathbf{2} & \mathbf{2} \end{pmatrix} \\ -\frac{1}{1} & \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \\ \hline & \begin{pmatrix} \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix} \end{array}$$

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{1} & \mathbf{2} & \mathbf{2} \end{pmatrix}} = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}$$

$$k = 1 \qquad\qquad i = 3$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} \boxed{1} & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{1} & \mathbf{2} & \mathbf{2} \end{pmatrix}}$$

$$R_3 \mapsto R_3 - \frac{1}{1} R_1$$

$$\begin{array}{rc} & \begin{pmatrix} \mathbf{1} & \mathbf{2} & \mathbf{2} \end{pmatrix} \\ -\frac{1}{1} & \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \\ \hline & \begin{pmatrix} \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix} \end{array}$$

$$\boxed{\begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{1} & \mathbf{2} & \mathbf{2} \end{pmatrix}} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}$$

$$k = 1 \qquad\qquad i = 3$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \begin{pmatrix} \boxed{1} & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}$$

$$k = 2 \qquad\qquad i = 3$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} 1 & 1 & 1 \\ 0 & \boxed{0.0001} & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}}$$

$$R_3 \mapsto R_3 - \frac{1}{0.0001} R_2$$

$$\begin{array}{rl} & \begin{pmatrix} \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix} \\ -\frac{1}{0.0001} & \begin{pmatrix} 0 & 0.0001 & 1 \end{pmatrix} \\ \hline & \begin{pmatrix} \mathbf{0} & \mathbf{0} & \mathbf{-9999} \end{pmatrix} \end{array}$$

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -10000 & 1 \end{pmatrix} \boxed{\begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}} = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{0} & \mathbf{-9999} \end{pmatrix}$$

$$k = 2 \qquad\qquad i = 3$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \boxed{\begin{pmatrix} 1 & 1 & 1 \\ 0 & \boxed{0.0001} & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}}$$

$$R_3 \mapsto R_3 - \frac{1}{0.0001} R_2$$

$$\begin{array}{rl} & \begin{pmatrix} \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix} \\ -\frac{1}{0.0001} & \begin{pmatrix} 0 & 0.0001 & 1 \end{pmatrix} \\ \hline & \begin{pmatrix} \mathbf{0} & \mathbf{0} & \mathbf{-9999} \end{pmatrix} \end{array}$$

$$\boxed{\begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{1} & \mathbf{1} \end{pmatrix}} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 10000 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ \mathbf{0} & \mathbf{0} & \mathbf{-9999} \end{pmatrix}$$

$$k = 2 \qquad\qquad i = 3$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 10000 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \\ 0 & \boxed{0.0001} & 1 \\ \mathbf{0} & \mathbf{0} & \mathbf{-9999} \end{pmatrix}$$

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 10000 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0.0001 & 1 \\ 0 & 0 & -9999 \end{pmatrix}$$