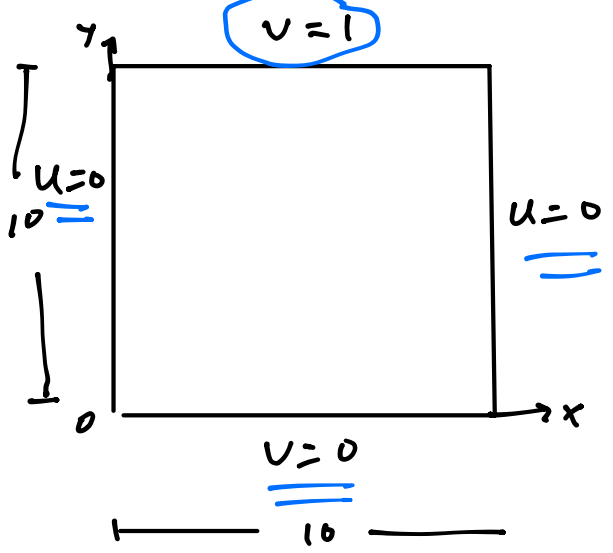
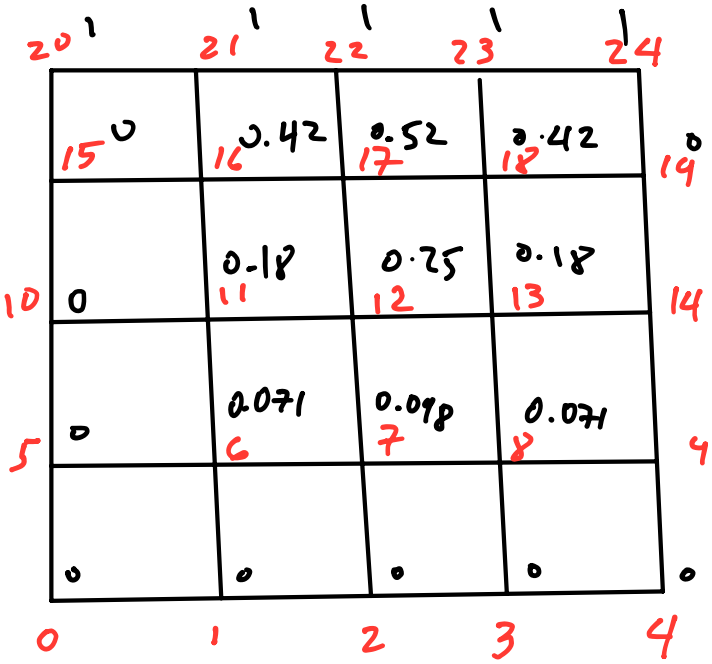
$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$$

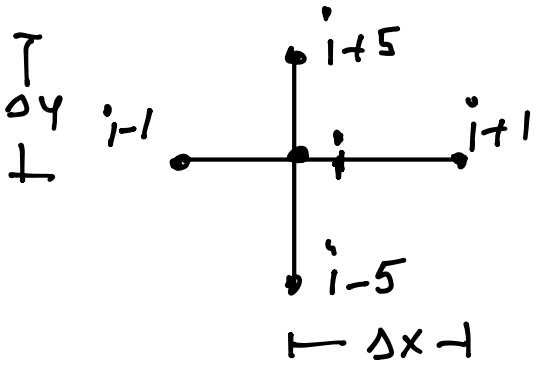
$u(x, y)$





(1)

$i = 6, 7, 8, 11, 12, 13, 16, 17, 18$



$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$$

$$\frac{v_{i-1} - 2v_i + v_{i+1}}{\Delta x^2} + \frac{v_{i-5} - 2v_i + v_{i+5}}{\Delta y^2} = 0$$

(2) $i = 20, 21, 22, 23, 24$

$v_i = 1$

(3) $i = 15, 10, 5, 0, 1, 2, 3, 4, 9, 14, 19$

$v_i = 0$

$i=0 \quad U_0 = 0$

$i=1 \quad U_1 = 0 \leftarrow$

$i=2 \quad U_2 = 0$

$\vdots$

$i=6 \rightarrow \dfrac{U_{i-1} - 2U_i + U_{i+1}}{\Delta x^2} + \dfrac{U_{i-5} - 2U_i + U_{i+5}}{\Delta y^2} = 0$

$$\frac{U_5 - 2U_6 + U_7}{\Delta x^2} + \frac{U_1 - 2U_6 + U_{11}}{\Delta y^2} = 0$$

Assembly

$$\begin{array}{c} \\ i=0 \\ i=1 \\ \\ \\ \\ i=6 \\ \\ \\ i=20 \end{array}
\begin{array}{c}
\begin{array}{ccccccccccc} & & & & U_5 & U_6 & U_7 & & U_{11} & & U_{20} \end{array} \\
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & \cdots & & 0 \\
0 & 1 & 0 & 0 & 0 & \cdots & & & 0 \\
 & & & & & & & & \\
 & & & & & & & & \\
 & & & & & & & & \\
0 & \frac{1}{\Delta y^2} & 0 & \frac{1}{\Delta x^2} & -\frac{2}{\Delta x^2} - \frac{2}{\Delta y^2} & \frac{1}{\Delta x^2} & 0 & \frac{1}{\Delta y^2} & 0 & 0 & 0 \\
 & & & & & & & & \\
 & & & & & & & & \\
0 & \cdots & & & & & & & & & 1
\end{bmatrix}
\end{array}
\begin{bmatrix} U_0 \\ U_1 \\ U_2 \\ \vdots \\ \\ \\ \\ \\ \\ U_{24} \end{bmatrix}
=
\begin{bmatrix} 0 \\ 0 \\ \\ \\ \\ 0 \\ \\ \\ 1 \end{bmatrix}$$