Example Problem:

Solving the Stream function following domain with appropriate boundary conditions:

$$\psi = 0$$

5.0 $\psi = 0$

$$\frac{\partial \psi}{\partial x} = 0$$

Out let

$\psi = 0$ $\psi = 100$

Grid points along x and y direction 41 and 31

1.0   5.7

0.3
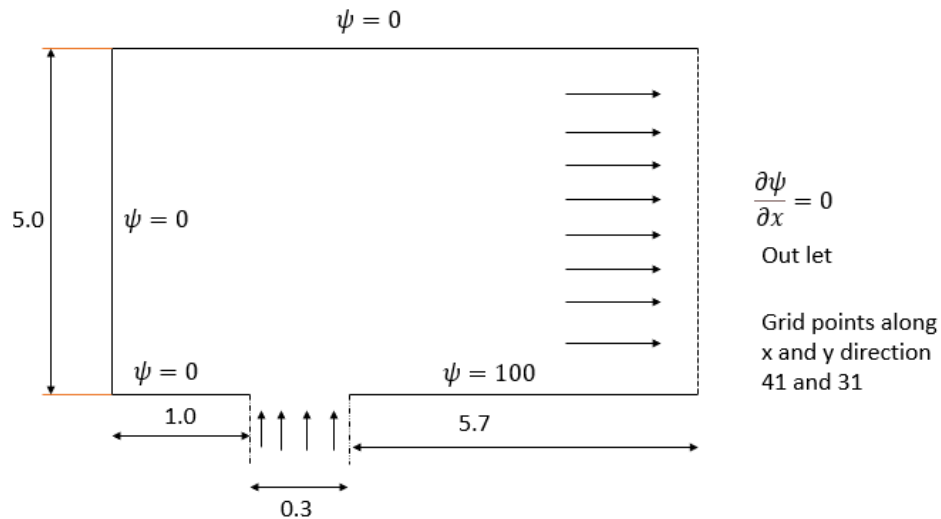
Boundary condition for stream function:

Left wall:

$$\psi = 100 \quad \text{-----(1)}$$

Top wall:

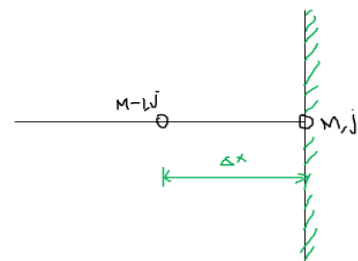$$\psi = 0 \quad --(2)$$

Right wall:

Neuman boundary condition

$$\frac{\partial \psi}{\partial x} = 0 \quad --- (3)$$

Apply forward difference approximation

$$\frac{\psi_{m,j} - \psi_{m-1,j}}{\Delta x} = 0$$

$$\psi_{m,j} - \psi_{m-1,j} = 0 \quad \text{------(4)}$$

Bottom wall

L = 0 to1.0 ; $\psi = 0$

L = 1.3 to 7.0 ; $\psi = 100$

L = 1.0 to 1.3 ; $\psi\ linearly\ varying\ 0 - 100$

Result:

The ψ valve up to 1.0 is based on appropriate boundary condition after 1.0 to 1.3 it ψ valve is varying 0 to 100.