$$Sin\left(\frac{\pi x}{L}\right)$$

1. Consider the steady diffusion equation

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

in the domain as shown. The particular problem chosen is the modified problem from Hoffman and Chiang. This is done in order to avoid approximate analytical solution and to maintain continuity of temperatures at the corners. The domain of the plate and the boundary conditions are shown in the figure. The value of W = 1 and L = 1.

y=W

T=0   T=0

y=0   x=0   T=0   x=L
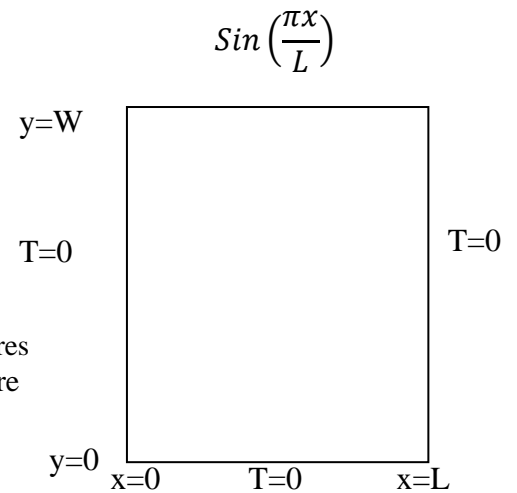
1. Check that $T(x,y) = \frac{Sinh\left(\frac{\pi y}{L}\right)}{Sinh\left(\frac{\pi W}{L}\right)} Sin\left(\frac{\pi x}{L}\right)$ satisfies the governing equation and the boundary condition.
2. Divide the domain into 5 X 5 blocks and solve this problem by Point method Compare the variation of the temperature T(0.4,y) along y with the analytical solution.
3. Similarly, compare the variation of the centreline temperature T(x,0.4) along x with the analytical solution.
4. Repeat the same by 10 X 10 blocks. This time compare the temperatures along the centrelines, T(x,0.5) along x and T(0.4,y) along y