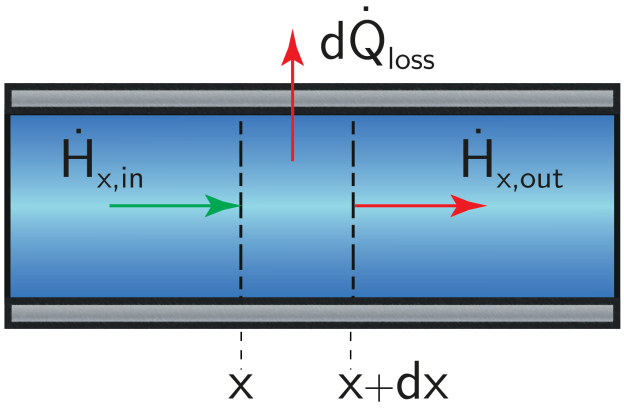
Boundary Conditions - Conv. - IE 3

Through a very long pipe with diameter D flows a fluid. In addition, the pipe has a uniform, constant wall temperature T_w.

Give the correct boundary conditions to solve the given differential equation for deriving the temperature profile in flow direction.



Given the differential equation:

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

In order to solve the differential equation, one boundary condition is required. This can be seen from the fact that the variable T has been differentiated once with respect to x.

Boundary conditions:

$$T(x = 0) \;=\; T_1$$

The boundary condition above describes that the temperature of the fluid equals T_1 at the entrance of the pipe, as can be seen from the figure.