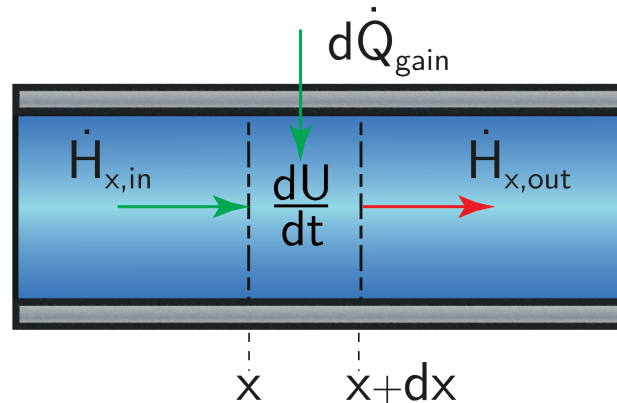


nBC - Conv. - IE 2

A fluid flows through a long cylindrical tube. A constant heat flux density \dot{q}'' is imposed on the fluid.

How many conditions are required to solve its differential equation and find an expression for the temperature profile in the flow direction?



Given the differential equation:

$$\frac{\rho c \pi D^2}{4} \frac{\partial T}{\partial t} = -\frac{u \rho c \pi D^2}{4} \frac{\partial T}{\partial x} + \dot{q}'' \pi D$$

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