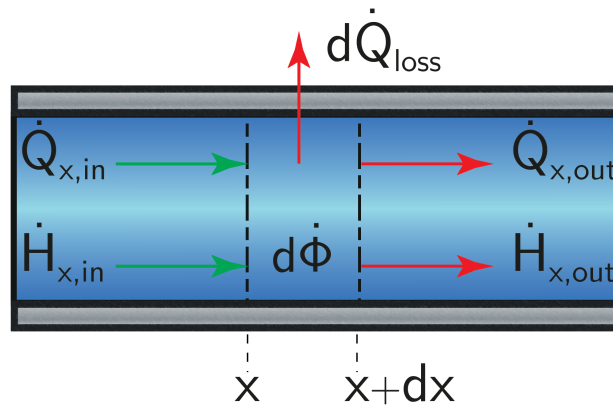


nBC - Conv. - IE 1

Through a very long pipe with diameter D flows a heat-generating fluid (homogeneous and constant source strength $\dot{\Phi}''' > 0$). In addition, the pipe has a uniform, constant wall temperature T_w

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:

$$0 = \frac{\lambda \pi D^2}{4} \frac{\partial^2 T}{\partial x^2} - \frac{u \rho c \pi D^2}{4} \frac{\partial T}{\partial x} - \alpha \pi D (T(x) - T_w) + \frac{\pi D^2}{4} \dot{\Phi}'''$$

In order to solve the differential equation, two boundary conditions are required. This can be seen from the fact that the variable T has been differentiated twice with respect to x .