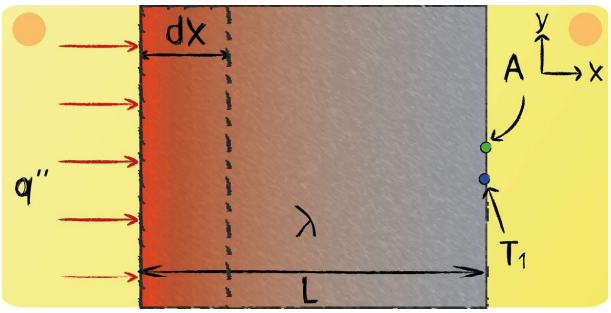
Lecture 2 - Question 7



A constant heat flux is being transferred through a wall. Develop an energy balance to calculate the temperature profile inside the wall and give the boundary condition. Assume steady-state heat transfer in x-direction.

Energy Balance:

$$\dot{Q}_{x,in} - \dot{Q}_{x,out} = 0$$

Heat Fluxes:

$$\dot{Q}_{x,in} = q'' A$$

$$\dot{Q}_{x,out} = -\lambda A \frac{\partial T}{\partial x}$$

The in- and outgoing flux should equal each other. The ingoing flux can be described in terms of the constant heat flux and the outgoing flux can be described by use of Fourier's law.

Boundary conditions:

$$T(x = L) = T_1$$

The boundary condition describes that the temperature of the wall equals T_2 on the right side of the wall.