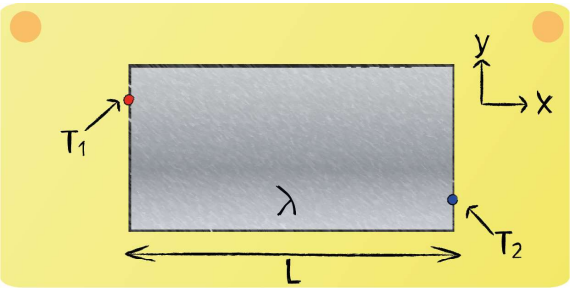
Lecture 2 - Question 4



Give the energy balance, describe the heat fluxes and give the boundary conditions. Assume one-dimensional steady state heat transfer.

Energy Balance:

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

Heat Fluxes:

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

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

Since steady-state conduction is the only type of heat transfer within the body, the in and outgoing flux should equal each other and are characterized by conductive heat transfer. This because energy is always conserved.

Boundary conditions:

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

$$T(x = L) = T_2$$

The boundary conditions above describe that the temperature of the body equals T_1 on the left side and T_2 on the right side, as can be seen in the sketched situation.