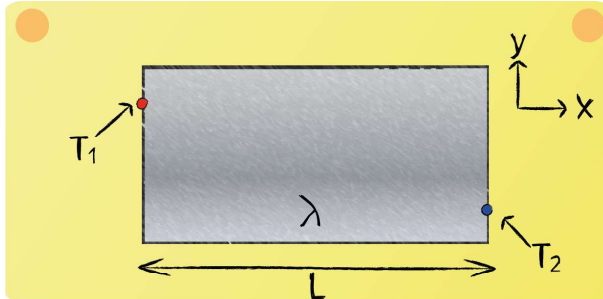


Lecture 2 - Question 4



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

Energy Balance:

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

Heat Fluxes:

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

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

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

The in and outgoing flux should equal each other and are characterized by conductive heat transfer. The outgoing flux can also be approximated by use of the Taylor series expansion, which will be zero in this case since the in- and outgoing fluxes equal each other.



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.

