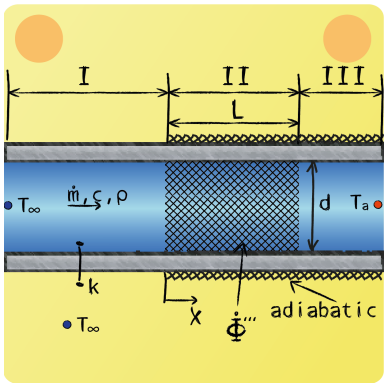
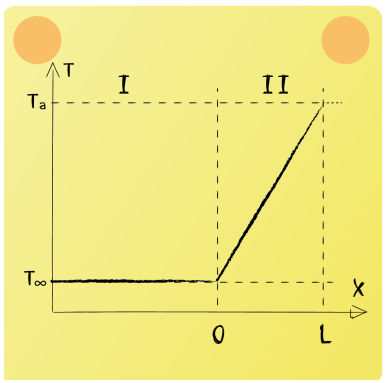
Lecture 7 Question 5.2

Water flows through a long tube which has adiabatic walls from a certain location $x = 0$. The area upstream of $x = 0$ is named region I. Between the point $x = 0$, and $x = L$ (region II) a very fine-meshed, electrically heated grid is located in the flow. Well ahead of the grid, the flow has the ambient temperature T_∞ and downstream of the grid, the temperature T_a.
Sketch the temperature profiles of the water in the pipe with consideration of the diffusive heat transport





Diffusive heat transport (=conduction) should not be considered. Therefore, no heat will be transferred in the opposite direction to the flow. And thus, just at the beginning of region II, the flow temperature start to rise linearly from T_∞.

At the end of region II, the temperature should have reached T_a linearly.