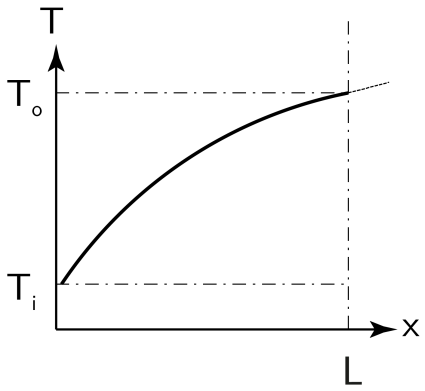
Temperature Profile - Internal Convection 04

Water flows through a pipe of length L and it is heated from temperature T_i to T_o. Heat transfer is driven by a constant heat flux $\dot{q}''$. Sketch the expected water temperature profile along the axis of the pipe.



Water enters at a temperature T_i.

From the entrance, it is being with a constant rate $\dot{q}''$. As the specific heat capacity is constant, the temperature of the water will increase linearly when along in the direction of the flow.

Eventually, the water leaves the system at a temperature T_o, but the slope is not horizontal due to the fact that still heat is being transferred towards the water at that position.