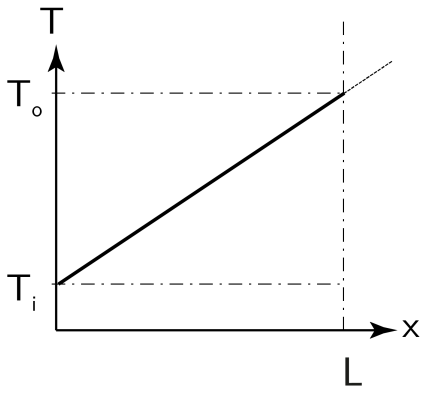
Temperature Profile - Internal Convection 03

Water flows through a pipe of length L and it is heated from temperature T_i to T_o. The wall of the pipe has a homogeneous constant temperature T_w. With: $T_\mathrm{w} > T_\mathrm{o}$. 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 heated due to convectional heat transfer. As the temperature difference between the fluid temperature and ambient temperature gets smaller, less heat is transferred toward the water and therefore the slope decreases gradually.

Eventually, the water leaves the system at a temperature T_o, but the slope is not horizontal due to the fact that $T_\mathrm{w} > T_\mathrm{o}$ and still heat is being transferred towards the water at that position.