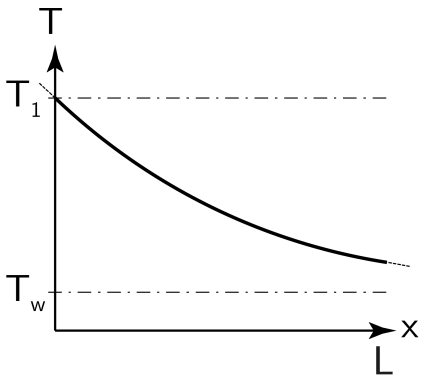
Temperature Profile - Internal Convection 01

Through a very long pipe with a diameter D flows a fluid. In addition, the pipe has a uniform, constant wall temperature T_w.

Sketch the profile of the average fluid temperature $T(x)$ in the flow direction.



The fluid enters the pipe with a temperature T_1.

When moving in the direction of the flow, the difference between fluid and wall temperature becomes smaller, and so does the rate of heat loss. Therefore the slope of the profile decreases when moving in the direction of the flow.

This will continue until the temperature approaches T_w with a horizontal slope, but in the given example this does not happen as the pipe is not long enough. Therefore this is the only suitable solution.