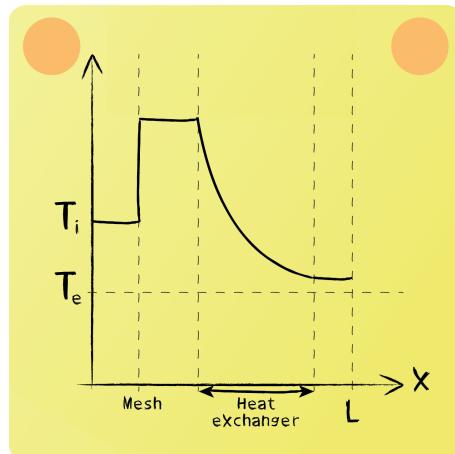


# Exam Prep. - Conv. - Forced Internal 03.4

Water flows through a pipe of length  $L$  and it is heated from temperature  $T_i$  by a heating mesh  $\dot{q}''$ . Afterward, a heat exchanger, which its outer walls have a temperature of  $T_e$ , extracts heat. Sketch the expected water temperature profile along the axis of the pipe.



Water enters at a temperature  $T_i$ .

As the duct is adiabatic, the temperature remains constant until it passes the heating mesh. After passing this mesh, the water received a certain amount of thermal energy, resulting in an instantaneous increase in its temperature.

When moving towards the heat exchanger, the temperature remains constant due to the adiabatic duct.

Once passing the heat exchanger, the temperature decreases with a decreasing slope, as the temperature difference between the fluid and the heat exchanger gets smaller and less heat is extracted.

Eventually, after the heat exchanger, the temperature remains constant again until the water leaves the duct.