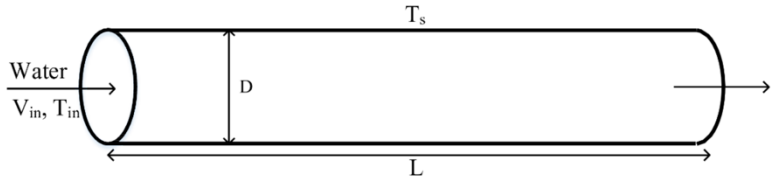
Fluid flows into an isothermal tube

As shown in the figure below, 88 °C water flows into a circular tube with a length of L = 15 cm and a D = 1 cm diameter at a speed of 1 m/s under normal pressure. The wall temperature (Ts) is maintained at 20 °C.

Density ρ (kg/m^3)	**Viscosity μ (Pa s)**	**Pr**	**Thermal conductivity k (W/m K)**
971.79	0.000354	2.219	0.67



Question: (After answering, please convert this file to PDF and upload it to E3)

1. Please attach the grid distribution of "velocity inlet" and screenshots of "Detail of Inflation." (10%)
2. Please attach a screenshot of "Statistics" in Detail of Mesh. (10%)
3. Please attach a screenshot of the momentum & thermal boundary condition settings of “Velocity Inlet” & “outlet”.(10%)
4. Please attach "Residuals" and screenshots of calculated cooling wall heat flux values. (10%)
5. Based on the plane conditions in Figure 2, draw the circular tube section's velocity & temperature distribution diagram (Contour). (10%)
6. Based on the baseline in Figure 3, draw the velocity & temperature curve of the circular tube (XY Plot). (10%)
7. Please explain the definition of boundary layer thickness. (10%)
8. Please explain the relationship between the preset addition of a circular pipe section and the flow field development before the main analysis area when simulating a circular pipe. (10%)
9. Please explain the necessity of grid independence testing. (20%)