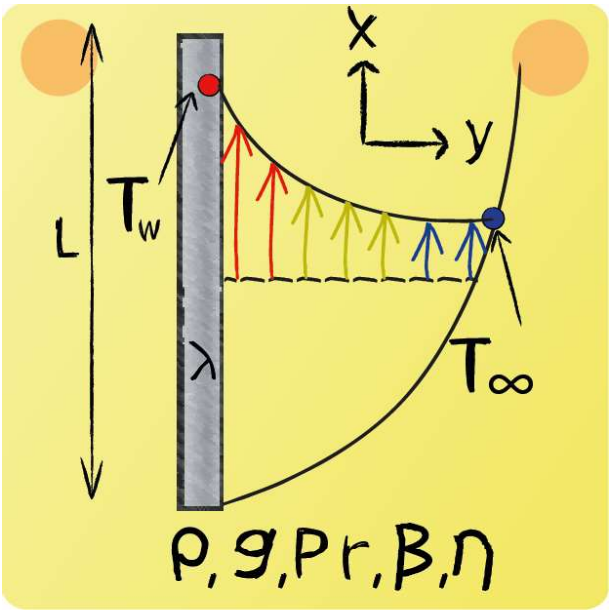
Lecture 10 - Question 1



A wall is cooled down due to natural convection by fluid. The wall has an isothermal surface. Determine whether the flow is laminar.

Grashof number:

$$\mathrm{Gr_L} = \frac{\rho^2 \cdot g \cdot \beta \cdot (T_\mathrm{w} - T_\infty) \cdot L^3}{\eta^2} = 2.22 \cdot 10^9$$

Thus:

$$\mathrm{Gr_L} \cdot \mathrm{Pr} = 1.60 \cdot 10^9 < 4 \cdot 10^9$$

For natural convection, a flow can be considered to be laminar when $\mathrm{Gr_L} \cdot \mathrm{Pr} < 4 \cdot 10^9$.