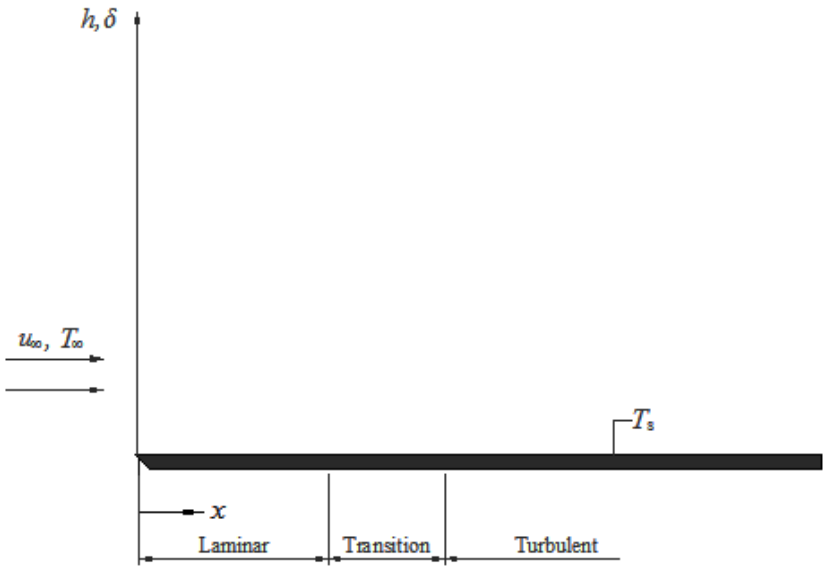
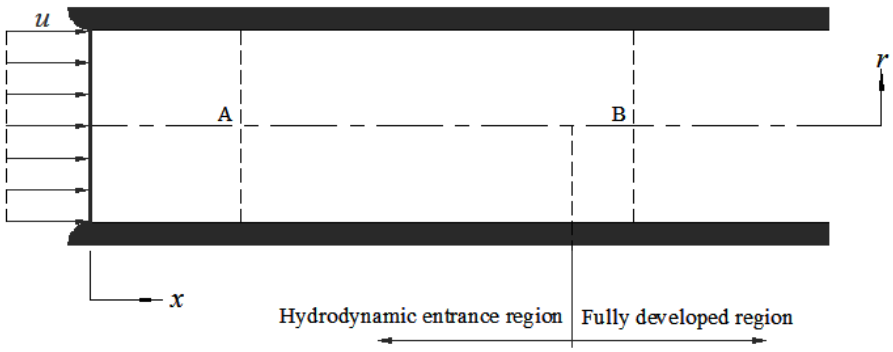
ME323, May 29, 2008 Quiz 2

Name: _____

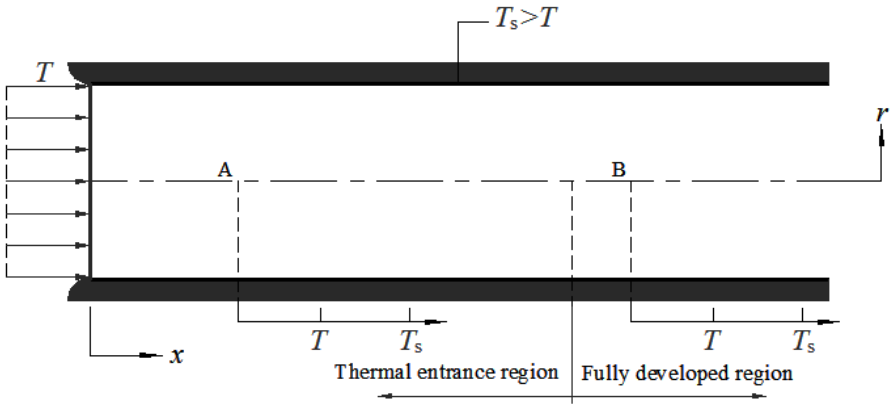
1. (6 pts) Sketch the variation of velocity boundary layer thickness δ and the local heat transfer coefficient h for flow in different regions over an isothermal flat plate where $T_s > T_\infty$.



2. For a laminar flow in a circular tube sketch the variation of the hydrodynamic boundary layer thickness δ in the hydrodynamic entrance region. Sketch the velocity profiles in the entrance region (A) and the fully developed region (B) (3 pts).



3. For a thermal boundary layer in a circular tube sketch the variation of the thermal boundary layer thickness δ_t in the thermal entrance region. Sketch the temperature profiles in the entrance region (A) and the fully developed region (B) (3 pts).



4. (1 pt) For convection heat transfer, an important dimensionless parameter is called Prandtl number, *Pr*. It is defined as

$$Pr = \frac{\nu}{\alpha},$$

where ν is kinematic viscosity and α=k/(ρc_p) is the thermal diffusivity. For forced convection transfer problem for internal flow, if $Pr < 1$, the hydrodynamic boundary layer develops more rapidly than the thermal boundary layer.

a). True
b). False