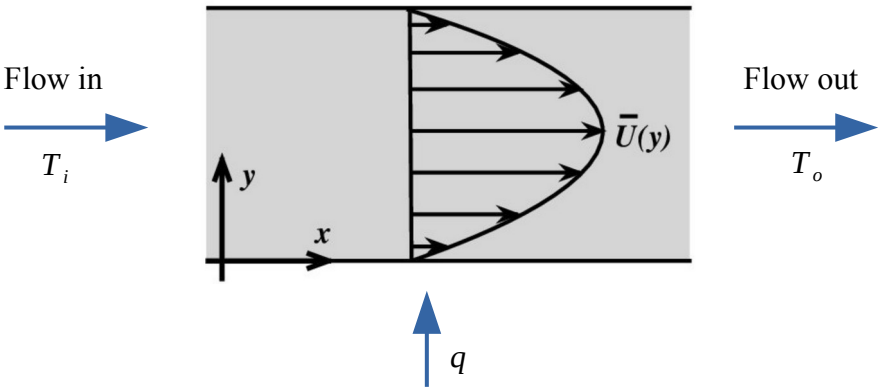
HW3, PP1



(b) calculate Reynolds number $Re = UD_h / \nu$

Since this is not a circular channel, the characteristic length is the hydraulic diameter, which in this case is $D_h = 2H$

For a typical channel flow, the critical Reynolds number is ~2300

(c) derive the velocity profile $u(y)$ (we are assuming a fully developed flow at steady state!)

Hint: start by crossing out all the terms that are zero in the Navier-Stokes equations. You should be left with an equation of the form $d^2u/dy^2 = C$, where C is some constant.

(d) solve outlet temperature with constant heat flux at the walls

Hint: apply $q = q''A$ and $q = mc_p dT$

(e) solve outlet temperature with constant temperature at the walls

Hint: apply $q = hA\,dT_{lm}$ and $q = mc_p dT$

Note that now we are using the logarithmic mean temperature difference!