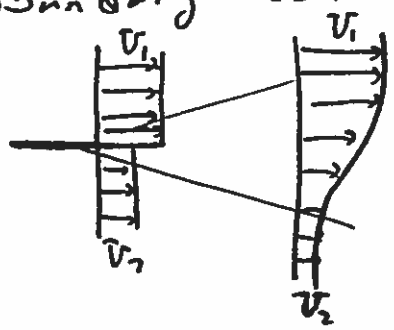
ME527/CE527/CH527 **Homework Set # 5**

1. For the flow in the mixing layer of two constant velocity stream state the governing equations and appropriate boundary conditions. Determine the similarity variables and show that $\eta \sim y/x^{1/2}$ and $\psi \sim x^{1/2} f(\eta)$.



2. Using $\frac{u}{U_\infty} = 1 - \exp\{-a\frac{y}{\delta}\}$ as an approximate expression for the velocity distribution in the boundary layer over a flat plate, determine δ, δ^* and θ. Find 'a' such that δ becomes identical to the exact solution of the Blasius equation.

3. Use the simplified momentum integral method (Walz) and determine the momentum thicknesses for $U = U_1 x^m$ and $m = 0.5$, 1 and 2.

4. For an axially symmetric wake show that $u_1 \sim f(\eta)\, z^{-1}$, $\eta \sim r/\sqrt{z}$, leads to a self-similar solution.

5. For flow past a cylinder, use the simplified form of Pohlhausen's method and evaluate the momentum thickness. Determine θ at $x = 0$. plot θ versus x/R.