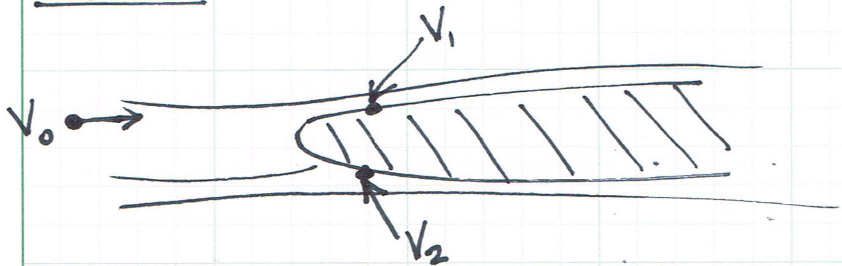
4.91) Ideal flow theory will yield a flow pattern past an airfoil similar to that shown. If the approach air velocity V_0 is 80m/s, what is the pressure difference between the bottom and the top of this airfoil at points where the velocities are $V_1 = 85$ m/s and $V_2 = 75$ m/s? Assume ρair is uniform at 1.2 kg/m³.

SKETCH:



KNOWN:

$V_0 = 80$ m/s
$V_1 = 85$ m/s
$V_2 = 75$ m/s
$\rho_{air} = 1.2$ kg/m³

UNKNOWN:

ΔP (kPa)

GOVERNING EQN:

$$\frac{P_1}{\gamma} + \frac{V_1^2}{2g} + z_1 = \frac{V_2^2}{2g} + \frac{P_2}{\gamma} + z_2$$

SOLUTION:

$$P_2 - P_1 = \frac{\rho}{2}(V_1^2 - V_2^2)$$

$$P_2 - P_1 = \frac{1.2\,kg/m^3}{2}((85\,m/s)^2 - (75\,m/s)^2)$$

$$= 960\,Pa$$

$$\boxed{\Delta P = 0.96\,kPa}$$