Heat Transfer and Viscous Flows
AERO452

Project
 Assigned: October 26, 2015
 Due: November 20, 2015

1. Determine the boundary layer parameters\(^1\) on an NACA0006 airfoil, assuming the angle of attack is \(a\) and the Mach number upstream of the airfoil is \(0.2 + 0.02b\), where \(ab\) are the last two digits of your student UIN number. The variation of the Mach number on the airfoil will be generated using the potential code provided.

   (a) Determine the velocity variation \(U(s)\) and its derivative \(U'(s)\) along the airfoil\(^2\).
   (b) Reproduce the table of page 76 that shows \(\Lambda, K, F(K), H_{12}\) and \(\delta_2\tau_w/(\mu U)\).
   (c) Compare Pohlhausen vs. Thwaites boundary layer results.

2. Determine whether the boundary layer separates or not.

3. Determine whether the flow transitions from laminar to turbulent.

To calculate boundary layer parameters, you may need to make certain assumptions. You should find the best possible assumptions from the material in the class notes. The TA will not help you in this matter.

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\(^1\delta, \delta_1, \delta_2, H_{12}, \tau_w\)

\(^2s\) is the coordinate along the airfoil surface