Homework 3: AE550, Viscous Fluid Flow

October. 2 2008

Due: October 9, 2008 (beginning of class)

Problem 1.

Determine the Blasius profile by solving

$$2f''' + ff'' = 0 (1)$$

numerically using the shooting method as described in class.

Plot the profile in a graph.

Also determine the displacement thickness and the momentum loss thickness numerically using the trapezium rule to approximate the integrals.

For an airplane flying at M=0.6 at an altitude of 30,000 ft with a flat plate airfoil wing under (nearly) zero angle of attack, determine the displacement thickness at 1m from the leading edge of the wing.

Summarize your results in a small report and attach your program at the end of the report. Make sure to (independently) write a clear and concise program.